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FRENCH INDUSTRY DURING THE WAR

ECONOMIC AND SOCIAL HISTORY
OF THE WORLD WAR

JAMES T. SHOTWELL, PH.D., LL.D., *General Editor.*

TRANSLATED AND ABRIDGED SERIES

*For List of Editors, Publishers, and Plan of Series
see end of this volume.*

FRENCH INDUSTRY DURING THE WAR

BY

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EDITOR'S PREFACE

IN the autumn of 1914, when the scientific study of the effects of war upon modern life passed suddenly from theory to history, the Division of Economics and History of the Carnegie Endowment for International Peace proposed to adjust the program of its researches to the new and altered problems which the war presented. The existing program, which had been prepared as the result of a conference of economists held at Berne in 1911, and which dealt with the facts then at hand, had just begun to show the quality of its contributions; but for many reasons it could no longer be followed out. A plan was therefore drawn up at the request of the Director of the Division in which it was proposed, by means of an historical survey, to attempt to measure the economic cost of the war and the displacement which it was causing in the processes of civilization. Such an "Economic and Social History of the World War," it was felt, if undertaken by men of judicial temper and adequate training, might ultimately, by reason of its scientific obligations to truth, furnish data for the forming of sound public opinion, and thus contribute fundamentally toward the aims of an institution dedicated to the cause of international peace.

The need for such an analysis, conceived and executed in the spirit of historical research, was increasingly obvious as the war developed, releasing complex forces of national life not only for the vast process of destruction, but also for the stimulation of new capacities for production. This new economic activity, which under normal conditions of peace might have been a gain to society, and the surprising capacity exhibited by the belligerent nations for enduring long and increasing loss—often while presenting the outward semblance of new prosperity—made necessary a reconsideration of the whole field of war economies. A double obligation was therefore placed upon the Division of Economics and History. It was obliged to concentrate its work upon the problem thus presented, and to study it as a whole; in other words, to apply to it the tests and disciplines of history. Just as the war itself was a single event, though penetrating by seemingly unconnected ways to the remotest parts of the world, so the analysis

of it must be developed according to a plan at once all embracing and yet adjustable to the practical limits of the available data.

During the actual progress of the war, however, the execution of this plan for a scientific and objective study of war economics proved impossible in any large and authoritative way. Incidental studies and surveys of portions of the field could be made and were made under the direction of the Division, but it was impossible to undertake a general history for obvious reasons. In the first place, an authoritative statement of the resources of belligerents bore directly on the conduct of armies in the field. The result was to remove as far as possible from scrutiny those data of the economic life of the countries at war which would ordinarily, in time of peace, be readily available for investigation. In addition to this difficulty of consulting documents, collaborators competent to deal with them were for the most part called into national service in the belligerent countries and so were unavailable for research. The plan for a war history was therefore postponed until conditions should arise which would make possible not only access to essential documents, but also the coöperation of economists, historians, and men of affairs in the nations chiefly concerned, whose joint work would not be misunderstood either in purpose or in content.

Upon the termination of the war, the Endowment once more took up the original plan, and it was found with but slight modification to be applicable to the situation. Work was begun in the summer and autumn of 1919. In the first place, a final conference of the Advisory Board of Economists of the Division of Economics and History was held in Paris, which limited itself to planning a series of short preliminary surveys of special fields. Since, however, the purely preliminary character of such studies was further emphasized by the fact that they were directed more especially toward those problems which were then fronting Europe as questions of urgency, it was considered best not to treat them as part of the general survey, but rather as of contemporary value in the period of war settlement. It was clear that not only could no general program be laid down *a priori* by this conference as a whole, but that a new and more highly specialized research organization than that already existing would be needed to undertake the Economic and Social History of the War, one based

more upon national grounds in the first instance, and less upon purely international coöperation. Until the facts of national history could be ascertained, it would be impossible to proceed with comparative analysis; and the different national histories were themselves of almost baffling intricacy and variety. Consequently the former European Committee of Research was dissolved, and in its place it was decided to erect an Editorial Board in each of the larger countries and to nominate special editors in the smaller ones, who should concentrate, for the present at least, upon their own economic and social war history.

The nomination of these boards by the General Editor was the first step taken in every country where the work has begun. And if any justification was needed for the plan of the Endowment, it at once may be found in the lists of those, distinguished in scholarship or in public affairs, who have accepted the responsibility of editorship. This responsibility is by no means light, involving, as it does, the adaptation of the general editorial plan to the varying demands of national circumstances or methods of work; and the measure of success attained is due to the generous and earnest coöperation of those in charge in each country.

Once the editorial organization was established there could be little doubt as to the first step which should be taken in each instance toward the actual preparation of the history. Without documents there can be no history. The essential records of the war, local, as well as central, have therefore to be preserved and to be made available for research in so far as is compatible with public interest. But this archival task is a very great one, belonging of right to the governments and other owners of historical sources and not to the historian or economist who proposes to use them. It is an obligation of ownership; for all such documents are public trust. The collaborators on this section of the war history, therefore, working within their own field as researchers, could only survey the situation as they found it and report their findings in the form of guides or manuals; and perhaps, by stimulating a comparison of methods, help to further the adoption of those found to be most practical. In every country, therefore, this was the point of departure for actual work; although special monographs have not been written in every instance.

The first stage of the work upon the war history, dealing with little more than the externals of archives, seemed for a while to exhaust the possibilities of research, and had the plan of the history been limited to research based upon official document, little more could have been done, for once documents have been labeled "secret" few government officials can be found with sufficient courage or initiative to break open the seal. Thus vast masses of source material essential for the historian were effectively placed beyond his reach, although much of it was quite harmless from any point of view. While war conditions thus continued to hamper research, and were likely to do so for many years to come, some alternative had to be found.

Fortunately, such an alternative was at hand in the narrative, amply supported by documentary evidence, of those who had played some part in the conduct of affairs during the war, or who, as close observers in privileged positions, were able to record from first- or at least second-hand knowledge the economic history of different phases of the Great War, and of its effect upon society. Thus a series of monographs was planned consisting for the most part of unofficial yet authoritative statements, descriptive or historical, which may best be described as about half-way between memoirs and blue-books. These monographs make up the main body of the work assigned so far. They are not limited to contemporary war-time studies; for the economic history of the war must deal with a longer period than that of the actual fighting. It must cover the years of "deflation" as well, at least sufficiently to secure some fairer measure of the economic displacement than is possible in purely contemporary judgments.

With this phase of the work, the editorial problems assumed a new aspect. The series of monographs had to be planned primarily with regard to the availability of contributors, rather than of source material as in the case of most histories; for the contributors themselves controlled the sources. This in turn involved a new attitude toward those two ideals which historians have sought to emphasize, consistency and objectivity. In order to bring out the chief contribution of each writer it was impossible to keep within narrowly logical outlines; facts would have to be repeated in different settings and seen from different angles, and sections included which do not lie within the strict limits of history; and absolute objectivity could not be ob-

tained in every part. Under the stress of controversy of apology, partial views would here and there find their expression. But these views are in some instances an intrinsic part of the history itself, contemporary measurements of facts as significant as the facts with which they deal. Moreover, the work as a whole is planned to furnish its own corrective; and where it does not, others will.

In addition to the monographic treatment of source material, a number of studies by specialists is already in preparation, dealing with technical or limited subjects, historical or statistical. These monographs also partake to some extent of the nature of first-hand material, registering as they do the data of history close enough to the source to permit verification in ways impossible later. But they also belong to that constructive process by which history passes from analysis to synthesis. The process is a long and difficult one, however, and work upon it has only just begun. To quote an apt characterization, in the first stages of a history like this, one is only "picking cotton." The tangled threads of events have still to be woven into the pattern of history; and for this creative and constructive work different plans and organizations may be needed.

In a work which is the product of so complex and varied coöperation as this, it is impossible to indicate in any but a most general way the apportionment of responsibility of editors and authors for the contents of the different monographs. For the plan of the History as a whole and its effective execution the General Editor is responsible; but the arrangement of the detailed programs of study has been largely the work of the different Editorial Boards and divisional editors, who have also read the manuscripts prepared under their direction. The acceptance of a monograph in this series, however, does not commit the editors to the opinions or conclusions of the authors. Like other editors, they are asked to vouch for the scientific merit, the appropriateness and usefulness of the volumes admitted to the series; but the authors are naturally free to make their individual contributions in their own way. In like manner, the publication of the monographs does not commit the Endowment to agreement with any specific conclusions which may be expressed therein. The responsibility of the Endowment is to History itself—an obligation not to avoid but to secure and preserve variant narratives and

points of view, in so far as they are essential for the understanding of the war as a whole.

* * * * *

For the most part, the text of the volumes of the various national series has been prepared in the language of the country concerned; and, as will be seen by reference to the "Outline of Plan" at the end of this volume, these texts with but few exceptions are published in their original languages. The most notable variation from this rule has been in the case of the Russian series, which, for the present at least, will be published only in English translation. There has also been some translation prior to publication, the aim being to present the entire body of the History of the War in the major languages of Europe: English, French, German or Italian, with the possible addition of Spanish if the scope of the history were extended in the direction of the Spanish-speaking countries.

In addition, however, to these original texts, a limited number of volumes of the European continental series are published by the American publishers in abridged and slightly modified translation. This "Translated and Abridged Series" has been prepared solely with regard to its possible usefulness for those who do not readily use the originals. It is therefore necessarily limited to volumes dealing with the more general subjects, such as the effect of the war upon the agriculture or manufactures of a country, and excludes the more special topics, like the treatment of individual industries, which would interest few except those who already know the language of the original study. This rule has been departed from in some instances in order to present to American or English readers data of peculiar interest which nevertheless come from a restricted field. The application of this criterion of usefulness naturally leaves the "Translated and Abridged Series" somewhat lacking in symmetry, in view of the fact that the British series and others (like the Russian and Japanese) originally appearing in English, are already available, without further editorial modification or abridgment.

The first volumes to appear in the abridged English translation deal with subjects of great importance, the effect of the war upon French industry, agriculture and food supply. There are similar

surveys of the mechanism of government control in war-time, of the social and material disturbances due to invasion, and of the doubly vexed question of France's war finance. Studies in Austrian and German war history and of that of the smaller nations parallel those of France, Belgium and Italy. These translated volumes, however, cover but a fraction of the field surveyed in the more special researches. Moreover, it should be noted that the more general monographs selected for translation are themselves the result of independent original research and are not dependent for their data upon the accompanying special studies prepared for more technical readers. This method of work, forced upon the authors by the exigencies of the scientific method, has sometimes led to seemingly different conclusions. But a careful examination of these apparent discrepancies will show that the ultimate synthesis is merely enriched by the consideration of variant aspects of a problem so vast and so elusive that no one statement, especially if cast in statistical formula, is adequate even to describe its terms.

J. T. S.

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INTRODUCTION

THE Carnegie Endowment for International Peace has entrusted to National Committees in a large number of countries the task of preparing a Social and Economic History of the World War. In the very full program drawn up by the French Committee, the share of the present volume relates to the internal policy adopted in France in the matter of production and consumption. In it will be described 'Industry in general,' the life of the various industries during the war, their displacements, how some developed and others stagnated. Certain industries, however, owing to their predominant rôle during war, have been dealt with in separate volumes,¹ to which the reader who desires a less summary description of them than is here provided will be able to have recourse.

In order to determine accurately the modifications that the war introduced into the life of the several industries, we shall begin by giving a general survey of the situation of French industry at the outbreak of war. The statistics relating to the various groups will enable us to show the number of works, of workmen, and the horse-power of which each disposed.

By ascertaining the geographical distribution of these industrial forces, we shall then be in a position to prepare, what is an essential preliminary, a statement of the losses due to the German invasion. Notwithstanding the victory of the Marne, the enemy were able to retain within their lines some of the richest portions of French territory. We shall have to establish the number, man-power, capacity of output and general characteristics of the factories which, within a few weeks of the commencement of hostilities, were swallowed up by the invasion.

But, as a result of the state of war, even the industries that remained within the French lines underwent profound modifications. Some became dormant or disappeared, whether from lack of labor, of raw material, or of demand for their products; others were

¹ These have not been translated into English. The student of the subjects they deal with is referred to the original French text.

created or much developed, to make good the loss of the invaded regions or to meet new needs. Many were transformed, either at once or little by little, to suit the requirements of national defense. These, naturally, were favored by the authorities; coal and raw material were supplied to them in ample quantities; and Government provided them with labor, either by drawing on other industries or by taking skilled workmen from the ranks, and sending them to the factories where they would prove most useful.

How, in these exceptionally difficult conditions, did the other industries contrive to exist? Did they obtain coal, though none was reserved for them? Did they find labor to replace the workmen who had been called up or transferred to the war factories? No doubt they had recourse to the labor supplied by women, old men, and refugees; but the work was often of an arduous kind, too trying for women, or required a degree of skill only to be obtained by long training.

The study of these different 'displacements' between industries, of the transfers of staff between civil factories and war factories, and of the consequent progress or decay of the several industries, constitutes the subject of this volume.

But this definition is too wide. To begin with, our examination of Industries during the War will not comprise agriculture, which is dealt with in other volumes of the series, nor the maritime service, nor fisheries, nor the liberal professions, nor the public services.

Further, for the convenience of our readers, we will enumerate at the outset the industries that are treated, more fully than in this work, in special monographs forming part of the 'Economic History.'

First among these are *Coal* and *Mineral Oil*, the principal sources from which industry and transport draw their energy and, perhaps more than any other substances, the true nerves of war. Their importance is illustrated by the fact that the State, where it did not go so far as to establish a monopoly of their output, exercised a close control over its production, sale, and price.

A special monograph is designed to deal with *Timber*, in harmony with the fact that the French Government centralized in the Timber Office the purchase and distribution of felled timber. Its policy in

this respect is accounted for by the enormous timber requirements of Munitions, Aviation, etc.

Special volumes will deal with *Metallurgy*, which played a pre-dominant part in the manufacture of munitions, rolling-stock, and motors; and with the *Chemical Industries*, which applied themselves to the production of explosives, poison gas, etc. Doubtless these industries were also able in some degree to meet private requirements, but only as a subsidiary feature in their operations. Their great and sudden development was for the purposes of war.

The *Aviation* industry, entirely devoted to national defense, and the *Railway* industry, which came in great part under the orders of the War Ministry, need merely be mentioned; and, in an auxiliary capacity, *Internal Water-ways* and *Ports*.

Finally come the *Textile Industries*, which were principally occupied with the clothing of the army, the manufacture of aeroplane fabrics, etc.

If we are asked why we have not completely excluded from our survey the industries that form the subject of special volumes, the answer is that we shall have to set forth the comprehensive statistics that include these industries in order to bring out the position of other groups. Moreover, even these industries, though engaged in the main on war work, were also employed to a considerable extent on civil requirements. And indeed, conversely, there is probably no industrial group that did not contribute in a greater or less degree to supply the needs of the armies.

This was notably so as regards the wood-working industries: carpentry, joinery, coach-building, cabinet-making, cooperage, brush-making, the manufacture of musical instruments and miscellaneous utensils. These industries exerted themselves to meet the needs of national defense at least as much as those of the civil population, turning out ammunition-chests, motor-bodies, wagons, gun-carriages, aeroplane parts, etc.

So it was, too, with the industries that work in leather and skins, and with the rubber industry: this last was engaged especially in production for military motor cars.

The following are the groups of industries as they will figure in

our work; the classification is that adopted for the purposes of the general census of professions carried out in France in 1906.

Extractive industries. Mines and quarries.

Manufacture of food and drink. Flour, butter, and cheese. Alcohol and sugar. Spirituous liquors and sparkling wines, beer, cider, aërated waters, ice. Baking and pastry-making. Preserves. Tripe. Starch, margarine, glucose.

Chemical industries. Pharmaceutic and various products. Non-mineral oils, candles, perfumery, animal oils and fats, gums, fertilizers. Acids, salts, and divers products. Illuminating gas, paraffin, briquettes. Explosives, phosphorus, electro-chemistry. Dyes, colors, varnishes, etc.

Manufacture of rubber, paper, cardboard, etc. Rubber and its substitutes. Paper, cardboard, paper and cardboard articles, wall-paper.

Printing, binding, and reproduction. Binding, book-sewing, etc. Printing and engraving. Photography, pictures.

Textile industries properly so called. Spinning of flax, hemp, jute, and substitutes. Weaving of linen and hemp. Spinning and weaving of cotton, wool, silk. Dyeing, dressing, bleaching, and printing of yarn and cloth. Hosiery, lace, guipure, embroidery, etc. Trimmings, ribbons, etc.

Manufacture of textile goods and clothing. Manufacture of tents, tarpaulins, and large textile articles. Clothing. Linen goods. Umbrellas. Hats. List slippers. Artificial flowers. Laundry, dyeing, cleaning.

Industries utilizing straw, feathers, hair. Basket-making, straw-plaiting. Manufacture of goods from feathers or hair.

Leather and skins. Preparation of hides and skins. Various articles. Shoes, gloves.

Wood-working. Saw-mills, carpentry, joinery. Wheelwright's work, carriage-building. Wooden utensils. Cabinet-making. Musical instruments. Fancy goods, brushes, etc.

Heavy metallurgical industries. Production of iron, steel, and divers metals.

Working of iron, steel, and ordinary metals. Forging, manufacture of edge-tools, wire-drawing. Nail-making. Constructional engi-

neering, lock-making. Sheet-iron. Gun-making. Boiler-making, foundries, engineering. Electrical apparatus. Copper or bronze apparatus and articles. Surgical instruments. Optical instruments or instruments of precision. Articles made of tinned iron, tin, lead, nickel. Clock- and watch-making. Toy-manufacture. Electroplating.

Working of precious metals and precious stones.

Stone-cutting, plaster molding, earth-work, stone construction. Public works, urban distributive services (water, electricity, etc.). Plumbing, roofing. Building.

Manufacture of lime, bricks, pottery, and glass. Manufacture of lime, cement, and plaster. Bricks and pottery. Earthenware and porcelain. Glass and enameling. Mirrors, decoration on glass.

Transport and storage. (N.B. Neither railways nor sea-transport will be dealt with in this work.)

Commerce and finance, including hotel-keeping, banks, etc.

We have retained this last group in our list because it will be interesting to glance briefly at the changes of a general character that the pressure of events imposed upon these industries.

It should be observed at the outset that although it may be possible to isolate for the purposes of a monograph some very homogeneous industry, the statistics available for the illustration of general tendencies relate to the above groups, and are not always susceptible of resolution among their constituent parts.

Before entering upon our subject, before even giving the plan of the work, we still have to define the extent of the industrial territory to which it will relate. We shall deal with so much of France as was not invaded. The conditions under which labor was carried on in the occupied districts were of a very exceptional kind; they do not enter within the scheme of this work, but will form the subject of a special monograph.

We shall assume the military front as it was fixed a few weeks after the first battle of the Marne, or, more precisely, as it was stabilized after the battle of Flanders, which ended in November 1914. From that time until the second quarter of 1918, it did not alter to an extent sufficient to modify appreciably the industrial

life that still survived in the immediate vicinity of the battle; and this is the point of view with which we are here concerned. We shall include in the region that was industrially incapacitated certain districts situated immediately on the hither side of the front and subjected to bombardments and to changes of military position; the industrial output of these districts was *nil* and many of them were even evacuated.

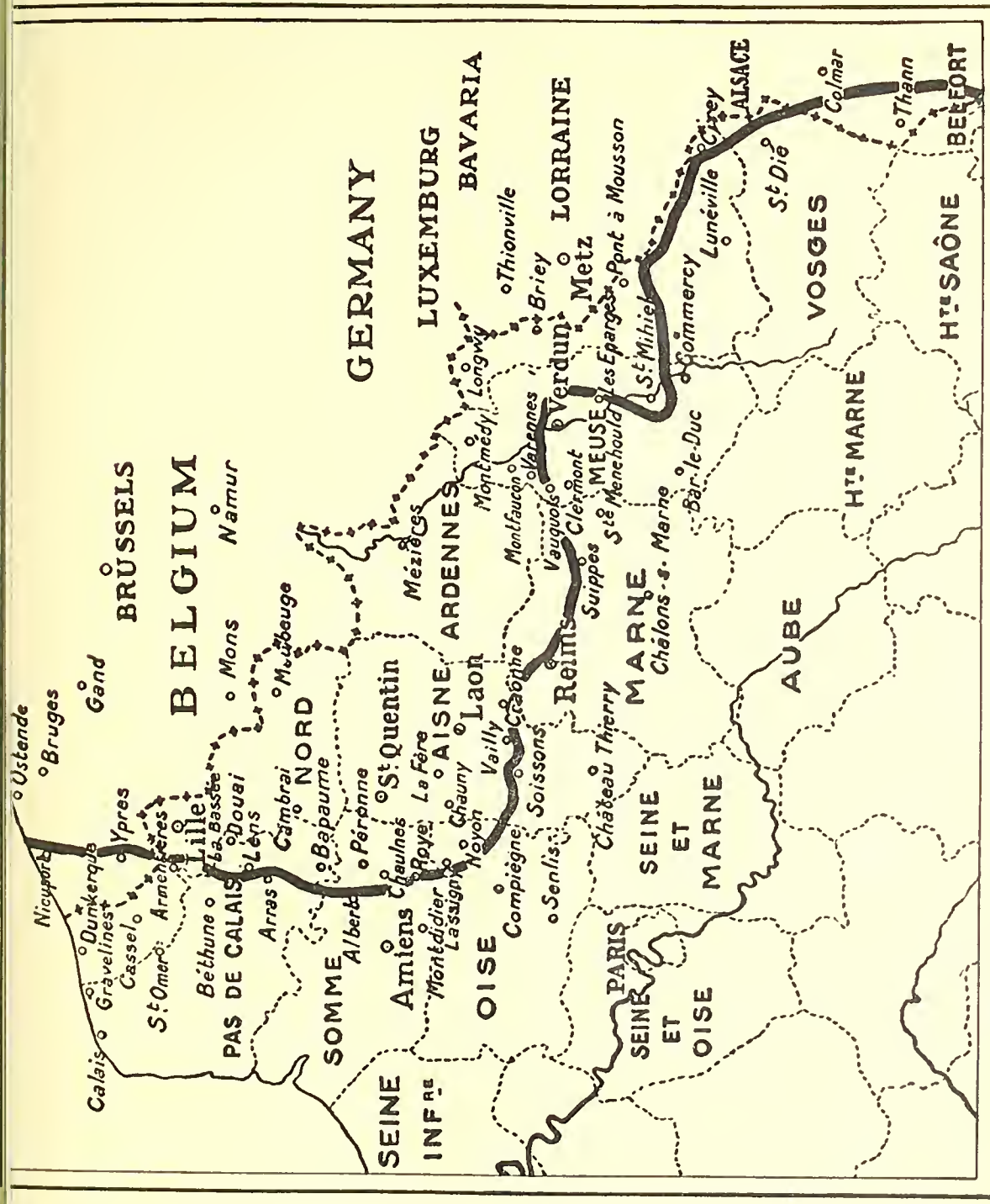
It would, however, be useless to attempt to introduce a high degree of precision in our definition of the territory: the pre-war statistics are drawn up on the basis of departments and only certain figures relate to smaller areas (*arrondissements*); and the exclusion or inclusion of particular *arrondissements* must be carried out somewhat arbitrarily, but this will have little effect on the general aspect of the phenomena. We shall first describe the front on the basis of the *arrondissements* through which it passed.

After the battle of Flanders, that is to say, from December 1914, and practically for the remainder of the war, the front, as it may be taken with sufficient accuracy from an industrial standpoint, started at Nieuport in Belgium, several kilometers to the east of Dunkerque; passed through Ypres and entered France to the east of Armentières; then led southwards slightly to the west of Lille, passed through Neuve-Chapelle, La Bassée, Lorette, and round Arras on the east.

To the south of Arras the front followed a wide semi-circle through Albert, the west of Péronne, Chaulnes, Roye, Lassigny, the north of Soissons and Craonne. It then traversed the north-east of Rheims, Perthes, Vauquois, the north and the east of Verdun, the south-west of St.-Mihiel and Pont-à-Mousson, whence it followed approximately the frontier of Alsace-Lorraine as far as the east of St.-Dié, thereafter striking directly south toward the Swiss frontier. A plan showing the line of the front is here given.

The departments traversed by the front or completely included in the conquered territory were ten in number: Nord, Pas-de-Calais, Somme, Oise, Aisne, Marne, Meuse, Meurthe-et-Moselle, Vosges, Ardennes. But they suffered, from an industrial point of view, in different degrees.

In the Nord out of seven *arrondissements* six must be considered



INDUSTRIAL CENTERS IN THE OCCUPIED AREA OF NORTHERN FRANCE

as rendered practically useless; in the Pas-de-Calais one and three-fifths out of six; in the Somme one and a half out of five; in the Oise three-fourths of one *arrondissement* out of four; in the Aisne three and three-quarters out of five; in the Marne two out of five; in the Meuse three out of four; in Meurthe-et-Moselle one and the half of each of two others out of a total of four; in the Vosges one-third of one *arrondissement* out of five. All five *arrondissements* of the department of the Ardennes were swallowed up in the invaded territory.

Thus in the ten invaded departments we find 22 *arrondissements* completely incapacitated and 7 others partly so. Several of these were among the richest in France and were industrially lost to her for the whole duration of the war.

We shall see that the 22 *arrondissements* in question represented 6 per cent of the total territory, and that the area of the 10 departments that were partially or completely incapacitated formed 11.7 per cent of the same.

We have now to state the plan of this work. It will be divided into two parts. The first will comprise, to begin with, a general survey of the industrial situation before the war, setting forth the principal characteristics of French industry and commerce as a whole, and distinguishing what the invasion immobilized from what remained of service. We shall then describe French industrial activity as a whole during the war, from July 1914 to the end of 1918, or even until 1920.

The second part will contain brief monographs on the several industrial groups.

PART I
GENERAL DESCRIPTION

CHAPTER I

SITUATION OF THE FRENCH INDUSTRIES BEFORE THE WAR. INDUSTRIAL IMPORTANCE OF THE INVADED TERRITORIES IN RELATION TO THE WHOLE

AMONG the various documents capable of supplying data for a general exposition of the French industrial situation before the war, we have chosen the general census of the population, which is taken in France every five years. The census taken in every tenth year beginning with 1911 deals in special detail with the civil characteristics of the inhabitants; that taken in every tenth year beginning with 1906 contains information in respect particularly of industries and professions. As the professional census of 1916 was not taken, it follows that the census of 1906 is that which will give us the detailed information we require. We shall make use either of the figures of the census of 1911, which deals with the civil population, or of figures of the professional census of 1906; but we shall correct with the help of the data taken from the census of 1911, or from other sources, such of the figures of 1906 as relate to industries whose development has been particularly rapid (metallurgy, chemical industries, etc.). Our figures will deal successively with personnel, establishments, motive power, and output.

(1) *Personnel.*

On the 5th March 1911 the total *legal population* of France was recorded as 39,191,133, among whom 20,931,221 declared themselves as following a profession. This last figure, that of the *active population*, represents 53.4 per cent of the total population. The figures of 1906 differ very little from those of 1911, so that we are justified in employing the former, subject to the reserve indicated in the preceding paragraph.

In 1906 the total *legal population* was 39,252,245; but the total *resident population*, to which the professional classification relates, was 38,844,653. The active population was 20,720,879 (army included) or 53.3 per cent of the total resident population. The ac-

tive population engaged in industry (army and agriculture excluded) was 7,058,580.¹

The regional distribution of the resident population and of the industrial population furnishes ground at the outset for some interesting remarks on the effect of the war. We will begin by subtracting from the total resident population and from the total industrial population the approximate number of inhabitants who found themselves detained in the invaded regions from November 1914 onward.

The total population of the *arrondissements*² that we reckon as invaded was, in 1906, 3,733,666. This number ought to be reduced by that of the refugees who succeeded in escaping, before the progressive advance of the Germans, into the interior of France. But, as it stands, it is sufficiently exact to serve for the purpose of general comparisons.

This total of 3,734,000 inhabitants represented 9.6 per cent of the resident population of France at the eve of the war, and the population of those parts of France which remained free was reduced by the invasion to 35,111,000.

Proceeding similarly as regards the industrial population (mines and quarries, industries properly so called, transport and storage, and public services of an industrial character) which numbered 7,058,580 as stated above, we find that 990,110 of these resided in the *arrondissements* that were completely incapacitated by the invasion. France therefore lost 14 per cent of her total industrial population as a result of the war, and the latter was reduced to 6,068,000 workers.

The total industrial population of the ten departments touched by the invasion, whose activity was gravely impaired thereby, was 1,544,000 or 21.8 per cent of the industrial population of the country.

We may complete these figures by giving the area of territory

¹ This total does not include unemployed, whereas the figures on p. 7 include them; nor does it include the army, prisoners, persons in hospital, etc.

² The French *département* is divided into three or four *arrondissements*. The words 'department' and 'departmental' are used in this translation in their geographical sense, unless the context clearly indicates the contrary. [Note by translator.]

lost by the invasion. The total area of France (excluding Alsace-Lorraine) is 536,408 sq. kilometers (about 207,000 sq. miles); the area of the ten invaded departments is 62,942 sq. kilometers (about 24,300 sq. miles) or 11.7 per cent of the whole. But as these were not completely invaded or entirely lost to France, this proportion is too high. The area of the *arrondissements* that were wholly invaded is about 32,000 sq. kilometers (about 12,400 sq. miles) or roughly 6 per cent of the total French territory.

This figure of 6 per cent is somewhat arbitrary, as is the very notion of a permanent military front. A higher proportion would be obtained if account were taken of the invasions and destructions of the first six months of 1918. Moreover the zone under enemy fire on the hither side of the permanent front may well be estimated at 1 per cent, and the zone that could not be utilized extended even further. A figure of 8 per cent or 9 per cent may accordingly be taken as representing the area of which the use was lost to France. The whole superficies of the departments affected by the invasion is, as we have seen, 11 per cent of the territory. So that in this broad sense there is ground for saying that one-tenth of the territory of France was incapacitated for the purposes of her industry.

It must however be observed that the idea of incapacitation, when applied to industries within the French lines, accurate as it may be in respect of premises, is less so in respect of plant, part of which was removed, and is incorrect as regards the active population, which withdrew to the rear.

A comparison of the various summary figures given above suggests the following remarks. Whereas the invaded area represented only 6 per cent of the total French territory, its inhabitants, owing to the greater density of the population in these favored regions, numbered nearly 10 per cent of the total population of France. And this percentage, again, is less than that of the industrial workers of the region, who constituted 14 per cent of the total industrial population. It was accordingly in its effect on the active part of the population, and notably on the industrial workers, that the invasion was most severely felt.

We will next set out the distribution of the total active population among the various industries, as it appears from the census of 1906 (Table 1).

TABLE 1

<i>Industry or profession</i>	<i>Total employed</i>	<i>Men</i>	<i>Women</i>
Fisheries	78,000	72,650	5,350
Mines and quarries	291,027	275,406	5,621
Forests and agriculture	8,777,053	5,452,392	3,324,661
Manufacture of food and drink	479,061	388,975	90,086
Chemical industries	124,644	109,913	14,731
Rubber, paper, cardboard	84,655	49,969	34,686
Printing, binding, reproduction	107,481	84,468	23,013
Textile industries	913,989	403,307	510,682
Manufacture of textile goods and clothing	1,551,131	171,000	1,380,131
Industries utilizing straw, feath- ers, hair	42,568	23,585	18,983
Leather and skins	334,203	279,974	54,229
Wood-working	704,695	659,306	45,389
Metallurgy	69,829	69,102	727
Working of ordinary metals	758,377	716,694	41,683
Working of precious metals	28,342	19,270	9,072
Working of precious stones	5,385	3,243	2,142
Stone-cutting and plaster mould- ing	46,612	44,947	1,665
Earth-work and stone construction	550,130	548,336	1,794
Lime, bricks, pottery, and glass	166,831	147,509	19,322
Insufficiently defined	11,283	5,309	5,974
<i>Total of manufacturing in- dustries</i>	5,979,216	3,724,907	2,254,309
Transport and storage ¹	887,337	646,229	241,108
Commerce, amusements, finance	2,002,681	1,231,701	770,980
Liberal and clerical professions	483,179	290,415	192,764
Personal attendance, domestic ser- vice	1,012,232	231,313	780,919
Public services (general) ²	1,142,861	1,042,525	100,336
Public services (industrial)	77,293	59,929	17,364
<i>Total</i>	20,720,879	13,027,467	7,693,412

The above figures may be accepted although they are taken from the census of 1906, for they do not differ substantially from those of 1911, as the following comparison shows (Table 2).

¹ Including railways.

² Including army.

TABLE 2

<i>Groups of occupations</i>	<i>Thousands of persons</i>	
	<i>In 1911</i>	<i>In 1906</i>
Agricultural professions	8,517	8,777
Industrial professions	7,486	7,193
Commercial professions	2,053	2,069
Liberal professions and public administrative services	1,225	1,032
Domestic service	929	946
Soldiers, sailors, fishermen	721	704
<i>Totals</i>	20,931	20,721

Agriculture is the most important occupation in France, by reason of the number of persons engaged in it, who form 42 per cent of the active population of the country. Although industrial employment (extraction of minerals, manufacture, transport, and public industrial services) is constantly gaining ground, it still holds only the second place, with 7,224,873 workers,¹ of whom 5,979,216 are employed in manufacture. Commerce provides employment for only two millions of persons.

Seventeen departments in France have more than 40 per cent of their active population engaged in industry, and of these seventeen nine were invaded, including those where the percentage is highest (invaded departments are given in *italics*):

<i>Nord</i> : 65 per cent	Seine-Inférieure: 49 per cent
District of Belfort: 61 per cent	<i>Oise</i> : 48 per cent
<i>Meurthe-et-Moselle</i> : 58 per cent	Seine et Oise: 47 per cent
Seine: 55 per cent	<i>Somme</i> : 45 per cent
<i>Vosges</i> : 55 per cent	<i>Aisne</i> : 44 per cent
Loire	Aube: 42 per cent
Bouches-du-Rhône	<i>Marne</i> : 41 per cent
<i>Pas-de-Calais</i>	
<i>Ardennes</i>	
Rhône	

If we now compare the number of persons engaged in the several occupations, in the whole of France and in the twenty-nine invaded or partially invaded *arrondissements* respectively, as fur-

¹ Including unemployed.

nished by the census of 1906—see Appendix II—we shall ascertain the percentage of workers that each occupation (or group of occupations) lost as a result of the invasion.

Taking first the groups, we find that metallurgy, with a loss of 52.7 per cent, was the industry that suffered most severely. Next came mines, with a loss of 41.8 per cent; and textile industries, with 29.4 per cent. Then in succession, straw, feathers, and hair, 21.2 per cent; lime, bricks, pottery, and glass, 18 per cent; forestry, 15.3 per cent; working of ordinary metals, 14 per cent; manufacture of food, 13.4 per cent. Compare these figures with the loss of territory, 6 per cent; of resident population, 10 per cent; of active industrial population, 14 per cent.

The industries that suffered least were those utilizing textile fabrics, 8 per cent; leather and hides, 8.6 per cent; wood, 8 per cent; precious metals and precious stones, 1 per cent or less. Maritime fisheries did not suffer at all, inland fisheries lost only 6.8 per cent and agriculture and cattle-breeding only 5.1 per cent of their personnel. It was the manufacturing industries that were most severely affected in this rich northern region, where the numerous factories and abundant plant were actively employed.

It will be interesting to review, as regards these, the losses suffered by the sub-groups. Among the textile industries, wool lost 64.3 per cent; linen and hempen cloth, 64.3 per cent; flax, hemp, and jute, 48.8 per cent; dyeing, dressing, and printing of cloth, 31.7 per cent; high proportions, which are significant of the damage done to these industries.

In the metallurgical sub-group, iron and steel lost 60.6 per cent, considerably more than half; divers metals, 19.6 per cent. In the manufacture of food and drink, certain sub-groups suffered very heavily: alcohol and sugar, 42.2 per cent; beer, cider, aerated waters and ice, 41.5 per cent; starch and margarine, 36.4 per cent. In the straw, feathers, and hair group, basket-making lost 30.7 per cent. In the working of ordinary metals, it will be noticed that sheet-iron lost 28.6 per cent, and that in lime, bricks, pottery, and glass, glass-making, and enameling lost 35 per cent.

Taking the whole of the manufacturing industries together, whereas they employed 5,979,000 workmen before the invasion, they were deprived as a consequence of it of 822,000 workmen, or 13.7

per cent of the total; approximately the same figure as the 14 per cent that represents the loss of the whole industrial population, and much more than the 8.7 per cent of loss suffered by the active population of all categories, including agriculture and the liberal professions.

(2) *Industrial Establishments.*

We shall now endeavor to deal on the same lines with industrial establishments. According to the census of 1906 the total number of 'establishments' (defined as a group of two or more persons working in conjunction in particular premises) was 3,720,565 for the whole of France. But excluding those where no hired worker was employed (e.g. where a husband and wife worked together) the total number was only 2,313,518. They were distributed among the main industrial groups as shown in Table 3.

TABLE 3

<i>Group of occupations</i>	<i>Number of establishments</i>	
	<i>Including those where no hired worker is employed</i>	<i>Where at least one hired worker is employed</i>
Fishery	13,450	11,368
Forests and agriculture	2,547,653	1,324,374
Extractive industries	7,576	7,266
Manufacturing industries	665,617	602,414
Transport and storage	24,498	20,999
Commerce, amusements, and finance	375,721	262,470
Liberal professions	54,605	53,984
Personal attendance and domestic service	30,532	29,730
Public services (industrial)	913	913
	<hr/> 3,720,565	<hr/> 2,313,518

It would assist us to know how many of these 3,720,565 establishments were comprised within the invaded zone. But we can only arrive at this approximately, for the census of 1906 gives the numbers of establishments by departments and not by *arrondissements*. We shall accordingly give both the census figures for the ten invaded departments, which are too high; and approximate figures for the area actually invaded or incapacitated.

The census figures for the ten departments are as given in Table 4.

TABLE 4

<i>Department</i>	<i>All establishments</i>	<i>Establishments comprising at least one hired worker</i>	
		<i>All kinds (agricul- tural, industrial, and commercial)</i>	<i>Manufacturing only</i>
Nord	84,773	67,268	30,551
Pas-de-Calais	59,464	42,743	13,716
Somme	41,134	28,065	9,434
Oise	30,171	21,540	7,994
Aisne	37,398	24,360	9,541
Marne	37,815	22,956	6,642
Meuse	23,571	13,867	3,540
Meurthe-et-Moselle	29,706	18,841	6,116
Vosges	34,281	20,582	5,901
Ardenne	20,024	13,606	5,062
<i>Totals</i>	398,337	273,828	98,497

As for the areas actually invaded, since the census is silent, we can only roughly conjecture the figures; we estimate at 200,000 the number of establishments of all kinds (agricultural, industrial, commercial, etc.) included in this area, and at 140,000 the number of those employing at least one hired worker. We have no data enabling us to distinguish between the several industries.

Some figures relative to the ten departments as a whole enable us to bring out how greatly the personnel of industrial undertakings was concentrated in this region and the intensive character of the production of the undertakings so concentrated. There were in all in these departments, as we have seen, 398,337 undertakings of all kinds, 273,828 employing one hired worker at least, and 98,497 of these belonged to manufacturing industries. The 398,337 undertakings represent 10.7 per cent of the undertakings throughout France. The proportion of undertakings employing staff is 11.8 per cent. The figure of 10 per cent, substantially lower than the 14.4 per cent which represents the loss in personnel for the same undertakings, emphasizes the concentration of the personnel in the invaded regions. Finally the percentage of manufacturing undertakings employing hired workers is 16.3, which is higher than the 11.8 per cent above and again brings into prominence the industrial character of the northern and eastern departments.

We need not dwell upon the loss of the principal coal and iron mines, a fact with which every one is familiar. But we may with advantage examine further the position of the manufacturing industries. We have seen that the proportion of manufacturing undertakings employing hired workers in the ten invaded departments was 16.3 per cent of the total. With this figure we will compare the loss suffered by the manufacturing industry expressed in terms of active population. The active population of the ten invaded departments engaged in manufacturing industries (1,265,658 persons) bears to the active population of the whole of France similarly engaged (5,979,216 persons) a proportion of 21.1 per cent. This figure is higher than the 16.3 per cent that represents the proportion of manufacturing undertakings in the ten departments, and again points to the same conclusion, the great concentration of industrial personnel in these regions. It is true that this proportion of 21.1 per cent drops to 13.7 per cent when we consider the area actually invaded, instead of the ten departments; but the industrial character of the invaded portion does not differ from that of the ten departments as a whole, and the relation between 21.1 per cent and 16.3 per cent is that which would be found between 13.7 per cent and the figure which the information furnished by the census does not allow us to establish in respect of the manufacturing establishments in the invaded *arrondissements*. The inference would be the same.

Finally Appendix III gives for each of the principal groups of industry the information that we have summarized for the manufacturing industries as a whole. It appears from it that the great metallurgical industries—like the mines that supplied them, the great factories utilizing metals, the pottery and glass-works, the paper works, the spinning and weaving mills, were principally though not exclusively situated in the north and east of invaded France.

(3) *Motive Power.*

We have considered the geographical distribution of French industry on the eve of the war from the point of view of number of workers and from that of number of undertakings. A further element of industrial strength is motive power. It will be interesting to

ascertain in what industries and in what regions were to be found the undertakings developing the greatest horse-power.

We shall first use the statistics of steam, hydraulic and other power published by the Ministry of Labor in 1906, subsequently correcting these as regards steam-power by more recent data.

On the 4th March 1906 the total motive power utilized in France by agricultural, industrial, and commercial undertakings, and in the various public services, amounted in round numbers to 3,550,000 h.p. This figure, which included power used for agricultural purposes, did not include locomotive power (locomotive engines, steam-boats, and automobiles). It was made up of 2,604,000 h.p. supplied by steam-engines, 773,000 h.p. supplied by hydraulic engines, and 173,000 h.p. supplied by other mechanical engines.

Out of 97,637 undertakings possessing one or more engines, 77 per cent were industrial undertakings; the remainder of the engines belonged to agricultural or other categories of undertakings. If we consider the power utilized by particular industries, the figures become instructive for our purpose. Thus the textile industry, located to so great an extent in the north and east, utilized in its mills nearly one-fifth, 17 per cent, of the total power employed in France. Next came the manufacture of food (flour and other mills), representing 13 per cent of the total power; urban distributions of electricity and water, 10 per cent; mines and quarries, 10 per cent; working of ordinary metals (forging, boiler-making, machinery, etc.), 9.9 per cent; metallurgy, 8.5 per cent.

Here are a few figures showing how each category of power was employed:

1. Steam-power, which produced more than three-fourths of the total horse-power generated, was distributed as follows: textile industries, 21 per cent; extractive industries, 13 per cent; ordinary metals, 11 per cent; food, 9 per cent; urban distributive services, 8 per cent; metallurgy, 7.8 per cent.

2. Hydraulic power was principally utilized by the food industries, which employed 30 per cent of the hydraulic engines; urban distributive services employed 17.5 per cent; metallurgy, 10.7 per cent; chemical industries, 9 per cent; wood-working, 5.75 per cent; paper and cardboard, 5.2 per cent.

3. As regards other kinds of engines, the industrial groups that chiefly utilized them were as follows, in the order of their percentages: working of ordinary metals; railroad enterprises (tramways, railway workshops, etc.); textile industries; wood-working.

All the above figures, but particularly those relating to steam-power, indicate clearly that it was the mining, metallurgical, and textile industries that utilized motive power most, industries whose principal center of activity was in the north and east of France.

It will be interesting to cast a rapid glance at the distribution, by industries and by region, of such large undertakings as employed motive force of more than 2,000 h.p. These numbered 173 in 1906, of which 143 employed steam-engines, and the remainder hydraulic engines. Of those employing steam-engines, 34 were mines, 34 were metallurgical enterprises, 21 were electrical power stations, 14 supplied electricity for railways or tramways, 9 were chemical or paper works, 9 were employed on public services. Here again we see that mines, metallurgy, and textiles, with 90 works of 2,000 h.p. or more each, absorbed the bulk of the motive power. Geographically, we find that three of the invaded departments (Nord, Pas-de-Calais, and Meurthe-et-Moselle) contained 52 out of the same 143 works employing steam-power, or more than one-third.

Taking the geographical distribution of motive power as a whole, we find that it is extremely unequal: 37 departments, each with more than 1,000 undertakings employing motive power, comprised 64,000 in all of such undertakings, out of a total of 97,637 for the whole of France, or more than two-thirds. The departments containing within their borders the largest number of undertakings so equipped were the

Seine, with 6.8 per cent of the total
Nord, 6 per cent
 Loire, 3.4 per cent
 Rhône, 2.7 per cent
Pas-de-Calais, 2.2 per cent

Isère, 1.9. per cent
 Puy-de-Dôme, 1.8 per cent
 Côtes-du-Nord, 1.7 per cent
 Seine-et-Oise, 1.7 per cent
Aisne, 1.7 per cent

The above are either mountainous departments, suitable for the use of hydraulic power, departments adjoining Paris or Lyons, or the industrial departments of the north.

If we examine the distribution on the basis of the total horse-

power developed, we find that out of 3,450,000 h.p., a half (1,565,000 h.p.) was installed in the following seven departments:

<i>Nord</i> , 14.4 per cent of the total for France	Seine-Inférieure, 3.8 per cent
Seine, 9.4 per cent	Isère, 3.6 per cent
<i>Pas-de-Calais</i> , 5.8 per cent	Loire, 3.5 per cent
Meurthe-et-Moselle, 5.1 per cent	

Next come Savoie, Saône-et-Loire, the Vosges, the Somme, etc. These were departments where the great mining, metallurgical, and textile industries were predominant, or which contain powerful waterfalls. Out of the dozen departments ten were invaded. In the ten departments affected by the invasion, the motive power in use totaled 1,140,710 h.p. or 33 per cent of the figure for the whole of France.

Leaving now aside hydraulic engines, which are especially employed in the mountainous districts, we find that out of 49,973 undertakings equipped with steam-power, 16,700, or one-third, were situated in the regions of the north and of Paris, that is to say in the following departments: *Somme*, *Aisne*, *Pas-de-Calais*, *Nord*, *Seine*, *Seine-et-Oise*, *Seine-et-Marne*, *Oise*, *Seine-Inférieure*.

TABLE 5

HORSE-POWER OF STEAM-ENGINES IN THOUSANDS OF H.P.

	1906	1913
Mines and quarries	364	576
Metallurgy	419	595
Agriculture	158	192
Food	223	235
Chemical and tannery	101	144
Textiles and clothing	484	539
Paper and printing	69	106
Furniture and utensils	35	49
Building	168	239
Electric power production	240	783
State services	62	80
<i>Total</i>	2,322	3,539

It was with motive power as with personnel: those industries which employed most workmen and developed the greatest horse-

power necessarily suffered most from the German invasion, because their principal centers were in the north and east.

Statistics published by the Ministry of Public Works for the year 1913 enable us to correct the above figures as far as steam-engines are concerned, by showing the development of their use since 1906. They disclose an increase between the two years of 1,200,000 h.p., distributed as shown in Table 5.

The following (see Table 6) are, for the principal industrial groups, the total motive power developed in 1913 in the whole of France, and the total developed in the ten departments affected by the invasion. The groups, be it noted, in this statement do not coincide with the groups of the census.

TABLE 6

<i>Industrial groups</i>	<i>Total h.p. in France</i>	<i>Total h.p. in the ten departments</i>	<i>Proportion per cent</i>
Mines and quarries	575,545	351,682	61.1
Metallurgical works	594,582	330,153	55.5
Agriculture	192,471	27,213	14.1
Food	235,331	108,705	46.1
Chemical and tanning	144,344	43,860	30.3
Textile and clothing	538,769	366,857	68.1
Paper and printing	106,500	25,525	23.9
Furniture and utensils	49,256	17,427	35.3
Electric power	783,383	133,667	17.0
Building	238,746	43,585	18.2
State services	79,759	7,105	8.9
<i>Total</i>	<i>3,538,686</i>	<i>1,455,779</i>	<i>41.0</i>

Forty-one per cent of the total steam-power was in the ten departments touched by the invasion; the proportion was more than two-thirds in respect of the textile industries, more than 60 per cent as regards mines and quarries, and 55 per cent as regards metallurgy.

To get a rough idea of the percentages of motive power comprised, not in the ten departments, but in the region actually invaded, the figures in the last column of the preceding table would have to be reduced in the proportion which the active population

of that region bears to the active population of the ten departments. Appendix I furnishes the materials for such a calculation.

(4) *Output.*

Our general review of the industrial situation in France before the war would not be complete without figures relating to production. These figures are supplied by a 'Report on French Industry, present and prospective' published in 1919 by the Ministry of Commerce as the outcome of a wide inquiry. It should be noted that the table below is not drawn up on the precise basis of the invaded regions, as delimited by a permanent army front. It relates to a wider and vaguer conception of industrial incapacitation—the regions that were invaded, under fire, or disorganized. The figures it gives are in consequence much higher than those calculated by us and set out in various passages of this book, especially in Part II (monographs). But it is the only statement that reviews a large number of industries, and, *subject to the above reservation*, it appears worth reproducing. It serves to bring home the enormous influence of the war on French national production.

We may point out, however, that if the zones under fire or disorganized were excluded and the region actually invaded were taken as a basis, the loss of output from coal-mines would be one-half instead of three-quarters, that of the foundries two-thirds instead of four-fifths. Although these are the two industries in which, by reason of their geographical distribution, the discrepancy is greatest, we will not attempt to draw precise conclusions from the table (see Table 7).

TABLE 7

	<i>Output in 1913 of districts invaded or under fire</i>		
	<i>Total output in 1913</i>	<i>Quantity</i>	<i>Percentage of total output</i>
	Combustibles		
	<i>tons</i>	<i>tons</i>	
Coal	40,844,000	30,224,560	74
Coke	4,027,000	3,080,000	76.5
	Iron and Steel		
	<i>tons</i>	<i>tons</i>	
Pig-iron	5,207,000	4,217,670	81
Steel	5,093,000	3,717,890	63

	<i>Output in 1913 of districts invaded or under fire</i>		
	<i>Total output in 1913</i>	<i>Quantity</i>	<i>Percentage of total output</i>
	Metals		
	<i>tons</i>	<i>tons</i>	
Copper	12,000	11,280	94
Lead	28,000	6,169	22
Zinc	67,800	51,800	76.5
	Manufactured Iron and Steel		
	<i>tons</i>	<i>tons</i>	
	4,483,000	2,690,000	60
	Engineering Products		
	<i>francs</i>	<i>francs</i>	
	1,209,000,000	300,000,000	25
	Textiles		
	<i>spindles</i>	<i>spindles</i>	
Wool	2,700,000	2,225,000	81
Cotton	7,500,000	2,225,000	29
Linen	577,350	539,667	93
	Wood		
	<i>cubic meters</i>	<i>cubic meters</i>	
Industrial	7,912,000	480,000	6
Fire	17,392,000	1,044,000	6
	Paper		
	<i>tons</i>	<i>tons</i>	
	700,000	28,300	4
	Chemicals		
	<i>tons</i>	<i>tons</i>	
	3,939,000	1,754,000	44.5
	Food		
	<i>tons</i>	<i>tons</i>	
Sugar	786,000	601,000	76
	<i>hectoliters</i> ¹	<i>hectoliters</i>	
Alcohol	2,954,000	1,500,000	59
Beer	16,000,000	5,000,000	31
	Glass		
	<i>sq. meters</i>	<i>sq. meters</i>	
Mirrors	1,160,000	928,000	80
	<i>bottles</i>	<i>bottles</i>	
Bottles	300,000,000	150,000,000	50
	<i>sq. meters</i>	<i>sq. meters</i>	
Window	10,000,000	8,000,000	80
	Pottery		
	.....	.....	25 to 50

¹ A heetoliter is approximately 22 gallons.

We shall see in the following chapters that these enormous losses of productive power were in part compensated. The needs of war gave a very great impulse to manufacture; large enterprises were started, output increased in such coal-mines as remained under French control, additional water-power was brought into use, and so forth. Nevertheless, partly as a result of these losses, French foreign commerce suffered to an extraordinary degree, and imports in particular increased enormously. The change in the relation of imports to exports, as measured by their value, is shown by the figures of Table 8.

TABLE 8

<i>Year</i>	<i>Percentage of imports to exports</i>	<i>Year</i>	<i>Percentage of imports to exports</i>
1912	123	1917	458
1913	123	1918	472
1914	131	1919	301
1915	280	1920	186
1916	332		

The proportion more than trebles during the war. We shall have occasion subsequently to return to this subject.

Recapitulation.

To summarize this chapter, we will set out a few figures illustrative of the situation of French industry in 1914, in the country as a whole and in those districts of which for several years it was to be deprived.

Before the war, the total area of France was 536,408 square kilometers (about 207,000 square miles); there were 38,800,000 inhabitants, among whom 20,720,000 followed an active occupation, and of these 7,060,000 were industrial workers.

After the battle of the Marne, the proportion of French territory occupied by the enemy was 6 per cent, the proportion rendered industrially useless, 8 to 9 per cent. The ten departments reached by the invasion constituted 11.5 per cent of French territory.

(i) *Figures relating to the region separated from France by the military front.*

Resident population lost to France	9.6 per cent
Industrial workers lost to France	14.0 per cent
Workers in manufacturing industries lost to France	13.7 per cent

As regards these industrial workers, their distribution among the several industries is briefly recapitulated in Table 9.

TABLE 9

(a) <i>Industries that were essential to the production of munitions</i>		(b) <i>Industries devoted in great part to meeting army requirements</i>		(c) <i>Industries principally devoted to meeting civil needs</i>	
	<i>Percentage of loss</i>		<i>Percentage of loss</i>		<i>Percentage of loss</i>
Mines	41.8	Wood-working	8	Quarries	11.1
Chemical industries	12.8	Rubber, paper, and eardboard	5.7	Food	13.4
Metallurgy	52.7	Textile industries	29.4	Printing, binding, etc.	9.4
Working of iron, steel, and divers metals	14	Manufacture of textile goods and clothing	8	Stone-dressing, etc.	12.1
Transport	11	Leather and skins	8.6	Earth-work and building	10.2
				Lime, bricks, pottery, glass	18
				Commerce	9.1
				Finance	7.3

There were in France before the war 3,720,000 'establishments'¹ of all classes, of which 2,315,000 employed one or more hired workers. Manufacturing industries comprised 665,000 establishments of all classes, 600,000 of which employed hired workers.

Of these the invasion cut off

200,000 establishments of all classes or 5.3 per cent of the total.

140,000 establishments employing hired workers or 6 per cent of the total.

(ii) *Figures relating to the ten departments reached by the invasion.*

Distributing the industrial population of these departments in

¹ For definition, see p. 9.

the same manner as they are distributed in Table 9, we get in the ten departments the percentages of the total industrial population of France given in Table 10.

TABLE 10

(a)		(b)		(c)	
Mines	57.5	Wood-working	15.9	Quarries	20.6
Chemical industries	17.6	Rubber, paper, etc.	15	Food	20.4
Metallurgy	62.1	Textile industries	43.2	Printing, binding, etc.	13
Working of metals	20	Clothing, etc.	14.4	Stone-dressing, etc.	16.1
Transport	17	Leather and skins	16	Earth-work and building	16.1
				Lime, bricks, pottery, glass	28.3
				Commerce	14.5
				Finance	11.4

The number of industrial establishments located in the ten departments were:

1. Establishments of all classes 398,337 or 10.7 per cent of the total
2. Establishments employing hired workers 273,828 or 11.8 per cent of the total
3. Establishments employing hired workers in manufacturing industries alone 98,497 or 16.3 per cent of the total

The total motive power employed in France in 1913, excluding railways and navigation, was about 4,500,000 to 5,000,000 h.p., distributed among 100,000 undertakings, of which it may be said that 77 per cent were of an industrial character. Forty-one per cent of the total steam-power was in 1913 located in the invaded departments. It may be added that in 1906 33 per cent of the total steam and hydraulic power was located in the same departments; this furnishes an approximate idea of the proportion in 1913. The steam-power employed (1913) in the ten departments by the several industries (classified as on p. 15) bore to the total steam-power employed in France the proportions shown in Table 11.

TABLE 11

(a)		(b)		(c)	
Mines	61	Clothing	68.1	Food	46.1
Metallurgical works	55	Furniture and utensils	35.3	Paper and printing	23.9
Chemical and tanning industries	30.3			Electrical power	17
				Building	18.2

From this brief recapitulation we can draw some notable conclusions. To begin with, a relatively small loss of territory (6 per cent of the whole) carried with it a loss in population of 9.6 per cent and a loss in industrial workers of 14 per cent—twice as great as the loss of territory. These figures give the measure of the demographic and industrial importance of the invaded region.

The ten departments that the invasion affected, taken in their entirety, represented 11.5 per cent of the French territory. They comprised 16.3 per cent of the manufacturing enterprises employing labor, 21.1 per cent of the labor employed in manufacturing industries, 41 per cent of the steam motive power utilized in those industries. The regions in question evidently contained the best equipped and best organized industrial undertakings.

The losses were especially severe in coal-mines, metallurgy (iron, copper, zinc), glass-works, textile industries, sugar, industrial alcohol, etc. The industries that suffered most were precisely those most required for the carrying on of the war.

CHAPTER II

MOBILIZATION. ITS IMMEDIATE EFFECTS. SUCCESSIVE CALLS TO THE COLORS AND CASUALTIES. SCARCITY OF LABOR AND REMEDIES

IN the very first days of the war, between the 1st and the 15th August, mobilization took 2,887,000 reservists from their homes. As nearly all these men followed an occupation, work in a large number of industrial and commercial undertakings slowed down considerably, if it was not completely arrested. Indeed, on the sudden invasion of France, there ensued as it were a momentary paralysis of industry and commerce.

If the dearth of labor due to the first call to the colors was immediately felt by agriculture, which set to work feverishly to harvest the crops, it was not so with industry and commerce, where, curiously enough, the first effect of mobilization was to produce unemployment, and many persons in the large cities found themselves without work. The explanation is that even in occupations where male labor played only a secondary part and might have been replaced by that of women, the mobilization of the manager of a business or of a few specialist workmen had sufficed to bring it completely to a standstill. Inquiries conducted about the 15th of August disclosed that, in Paris and the Seine department alone, the number of unemployed reached 600,000. And as at first the general belief was that the war must be of short duration, steps were not taken to find employment for them, and many businesses remained closed. Figures taken from reports of Labor Inspectors indicate that, out of 100 establishments working before the war, only 48 to 50 remained open in August 1914; one in two had been closed. Correspondingly, the staff employed had diminished at the same date by two-thirds: out of 100 workers only 34 remained at work. As the men mobilized represented about 25 per cent of the total of workers employed in July 1914 in commercial and industrial undertakings, it follows that the proportion of unemployed in August may have reached 40 per cent. It was only at a later stage that the needs of national defense and those of the civil population compelled

a reorganization, and that unemployment diminished, to be replaced by a highly embarrassing scarcity of labor.

To the disorganization of personnel were added, from the outset, other difficulties, the chief of which related to transport and credit.

As regards transport, the railway lines, being almost exclusively employed on the transport of troops, war material, and military supplies, were at first completely, and afterwards in great part, closed to commercial traffic. Manufacturers and dealers saw most of their own means of transport, horses, carriages, and motor lorries, carried off by requisitions. Maritime transport suffered equally: sea communications, even before the opening of the submarine campaign, became more difficult, owing to the requisitions of ships and the insecurity of the trade routes. All these impediments soon brought about a dearth of raw materials and particularly of coal, a commodity on which industrial undertakings are specially dependent and the scarcity of which was already being intensified by the partial invasion of the French coal-mines. Certain other commodities were little manufactured except in the invaded districts (wool, thread, needles), or came from Germany (lamp-chimneys, special drugs), or were exhausted by the requirements of the army (military cloth, preserved foods, etc.). All these articles reached France in insufficient quantities. On the other hand the difficulty of communication with Russia, Turkey, and the Balkans accentuated the loss of the German and Austrian markets for French goods.

As regards credit, the moratoria in respect of trade bills and deposits, promulgated by the decrees of the 1st, 2nd, 5th, and 9th August, 1914, immobilized bank deposits, wiped out working capital for the moment, and put an end almost completely to credit transactions: manufacturers and traders hardly dealt any longer except for spot cash.

All these sources of trouble were interconnected; coming on the top of the dismay caused by the first invasion, they completely paralyzed business. We must remember how the situation, after the knockdown blow dealt to commerce and industry by the mobilization, was further aggravated during the first weeks of the war; the sudden invasion, designed as much with an economic as a strategic purpose, robbed France at a stroke of ten departments containing her richest mining and industrial centres, and drove back on the

interior hundreds of thousands of workmen, whose arrival in the towns intensified the already prevailing unemployment.

The immediate result of mobilization was accordingly a short period of complete industrial disorganization and of wide-spread unemployment. But vigorous efforts were at once called for in many directions: in respect of *commodities*, the enormous industrial requirements of the war had to be met, and subsidiarily the industrial requirements of the civil population; in respect of *labor*, while the effective strength of the army had to be kept up, an increased supply of labor was required for munition factories, and a sufficient supply for other industries. Unemployed and refugees were soon absorbed and other means of finding labor had to be resorted to.

We shall in this chapter draw the reader's attention to the magnitude of the number of men called to the colors and of the losses suffered by the army and in consequence by the active population of the country. We shall indicate the methods adopted to secure the indispensable supply of labor: temporary exemptions, furloughs, organization of employment through official agencies, utilization first of unemployed and refugees, then of foreign and colonial labor, and of prisoners of war; intensified work in factories, night shifts, overtime; increased employment of women; training of disabled soldiers. All these methods are described and analyzed in separate volumes of this History, but they will be dealt with summarily here, that the reader may have the situation before him in its entirety. No means could be neglected to avert a crisis in the supply of labor, which at any moment might have endangered the country's defense and its economic life.

We will first indicate by a few figures the rapid diminution of unemployment, and the moment when the scarcity of labor that was to prevail throughout the remainder of the war first became apparent. Information is available on this subject, not only in the statistics of unemployment, but in the quarterly (afterwards half-yearly) reports of the Labor Inspectors. These show that, almost immediately after the first sudden collapse, there was a regular and uninterrupted progress both in the number of establishments at work and of personnel employed. We have already said that out of

100 establishments working before the war, one-half only were open in August 1914. By January 1915 this proportion had increased to about 65 per cent, by July to three-fourths; and by the 1st January 1916 to four-fifths.

Similarly as regards employment: the proportion of workers employed in August 1914 to the number employed before the war had been only 34 per cent, or one-third of the normal; in January 1915 it was 57 per cent, in July 68 per cent, and in October 80 per cent. The reduction of unemployment was thus, after five months of war, already considerable. The proportion of labor employed was 57 per cent of the normal; but the balance, 43 per cent, does not repre-

TABLE 12

<i>Industrial group</i>	<i>Difference between personnel employed normally and on 1st January 1915 per cent</i>	<i>Proportion of personnel mobilized per cent</i>	<i>Proportion of personnel unemployed per cent</i>
Manufacture of food	29	26	3
Chemical industries	41	27	14
Rubber, paper, etc.	50	19	31
Printing, binding, etc.	62	24	38
Textile industries	31	15	16
Clothing, textile goods, straw, feathers, and hair, etc.	49	6	43
Leather and skins	36	26	10
Wood-working	69	30	39
Metallurgy, ordinary metals	39	32	7
Precious metals and precious stones	88	23	65
Stone-cutting, earth-work, build- ing	78	33	45
Lime, bricks, pottery, glass	63	28	35
Transport and storage	37	32	5
Various commercial industries	44	25	19
<i>General percentage</i> ¹	44	24	20

¹ The figures in this table are those resulting from the returns of January 1915. If we substitute the mean of the figures furnished by the twelve retrospective inquiries carried out periodically down to January 1919, the general percentage for the first column would be 42 instead of 44, and for the last column 18 instead of 20.

sent unemployed, for it includes the mobilized men. As these must be estimated, at the beginning of the war, at 24 or 25 per cent of the total personnel of undertakings subject to inspection, the proportion of unemployed cannot at this time have exceeded 20 per cent. In Table 12 are given the proportions of employment in each of the great industrial groups in January 1915, as published by the Ministry of Labor; metallurgy, chemical industries, manufacture of food, transport and storage, were at this date already short of labor.

Thus the unemployed, who were 40 per cent of the workers in August 1914, were reduced to less than 20 per cent in January 1915, notwithstanding the influx of refugees; their number became insignificant in October and unemployment practically ceased in January 1916. Industry as a whole was feeling the dearth of labor by the second half of 1915.

We must now give details regarding the number of men mobilized, the casualties (killed, missing, prisoners, and discharged medically unfit), exemptions from military service, and furloughs; in a word, regarding the man-power absorbed by the military effort, and the measures taken to mitigate the consequences of that effort and to reconcile it with the requirements of industry, whether directed to the purposes of war or to meet other vital needs. We shall also give a few figures to indicate the contribution made by each industrial group to the country's defense.

As casualties occurred—and they were numerous—gaps were filled either by calling up younger classes, or by re-examining men who had been temporarily exempted or discharged unfit; in short by every possible method. The defense of the country being the capital point, the first care was to maintain the effectives of the army, without perhaps sufficient consideration for the agricultural and industrial needs of the interior. There ensued, about the 1st July 1915, a first period of industrial crisis. The situation was then as follows.

In a fortnight the mobilization had placed under the orders of General Joffre, the Commander-in-Chief, a total French contingent of 3,704,000 men, of whom 2,887,000 were mobilized reservists. The classes of 1914 and 1915 were incorporated and postponements of

service were canceled. The men of earlier classes and of the auxiliary services who had been classed as medically unfit or exempted were subjected to repeated examination, in the course of which all fit men were taken, the standard of fitness being constantly relaxed. These scrupulous re-examinations were a characteristic manifestation of the intense recruiting activity: men of the 1914 class whose military service had been adjourned were re-examined no less than six times, men of the 1915 class no less than five times.

But the Marne, the race to the sea, and the Yser, cost France 455,000 killed and missing, and 400,000 wounded. Early in 1915 a fresh, mighty effort enabled her to add 2,740,000 men to the troops already mobilized: the class of 1916 was called up in April 1915; the old classes of 1891 to 1889 were recalled; there were fresh examinations of men exempted or classed unfit, and of the auxiliary services.

As a result, if, on the 1st July 1915, the army strength was satisfactory, it was not so with industry, whether military or private, which was seriously embarrassed. And yet a great and immediate effort was called for to increase the supply of munitions. The moment had come when the recall of skilled workmen from the ranks to the factories was absolutely necessary; their status had been defined by the recently adopted Dalbiez law, and the munition factories were enabled by it rapidly to recover 300,000 men, a number that was shortly raised to 500,000.

After Verdun, which from February to June 1916 cost France 110,000 killed or prisoners and 190,000 sick or wounded, there occurred early in 1917 an even more formidable crisis. The manpower policy had so far given good results, because it had been possible to maintain equilibrium between the needs of the army and the economic requirements of the nation. But complaints were now frequent, and the state of agriculture in particular was becoming increasingly precarious, as the summoning of fresh classes to the colors no longer found compensation in the release of the older classes. In January 1917 60,000 men were restored from the army to agriculture, a further 210,000 men between April 1917 and March 1918, and 153,000 were provisionally exempted or released.

Notwithstanding these drafts, the French army still numbered on the divers fronts, at the 21st March 1918, 2,900,000 men, and

played a decisive rôle on the occasion of the final offensive; and this in spite of the fact that it had already borne the brunt of the struggle, as the following brief calculation will show. During the war 12 Belgian divisions held an average front of 30 kilometers, and each division was exposed to wastage on a front of $2\frac{1}{2}$ kilometers; 62 British divisions held an average front of 190 kilometers or 3 kilometers per division; 110 French divisions held an average front of 630 kilometers or $5\frac{1}{2}$ kilometers per division. At the Armistice the Belgian army occupied 30 kilometers of front, the British army 90 kilometers, the American army 100 kilometers, the French army 330 kilometers. Out of a general total of 210 divisions representing 4,007,442 combatants and a ration strength of 6,471,589, France had 102 divisions.

France with a population of $39\frac{1}{2}$ million inhabitants mobilized 7,935,000 men or 21 per cent of her population. Her losses amounted to 1,354,400 killed or missing, or 16 per cent of her contingent. She further mobilized 475,000 native troops, of whom 72,400 or 15 per cent were returned killed or missing. To these figures we must add 485,460 prisoners of war and 700,000 men discharged medically unfit. And there were other losses besides, for many died as a result of wounds or sickness. It should be noted also, because the fact reacted on reeruiting and on the available active population, that 2,800,000 men were wounded, at least one-half of them twice. This number does not include the slightly wounded who rejoined their units after a few days.

Losses Suffered by the Great Industrial Groups.

If mobilization had operated proportionally to the number of citizens in each social category and if there had been no exemptions in favor of this or that profession, the number of killed, prisoners, and discharged medically unfit would have been approximately proportional to the total number of persons in each class. But this was not so. According to the census of 1911 the active population (agriculture, industry, commerce, domestic service, liberal professions, mines and quarries, transport, and public services) numbered 20,931,000, of whom 7,762,000 were women. Deducting the latter, there remained an active male population of 13,169,000, which comprised the army, about 525,000 men, also to be deducted. Mobiliza-

tion accordingly in 1914 affected a civil population of 12,644,000 men, distributed among the various occupations as in Table 13.

TABLE 13

<i>Occupations</i>	<i>Men</i>	<i>Percentage</i>
Agriculture	5,237,000	41.40
Industry	3,406,000	26.95
Commerce	1,228,000	9.71
Domestic service	34,000	0.27
Liberal professions	310,000	2.45
Mines and quarries	246,000	1.95
Public services	640,000	5.06
Transport	1,543,000	12.21
	<hr/> 12,644,000	<hr/> 100

But these various categories were not mobilized in equal proportions. Two industrial groups, for instance, public services and transport, were only partially mobilized, and the resulting deficiency was made good by the other groups in proportion to their numbers. This gives for the several occupations the following percentages of the total number of men called up (see Table 14).

TABLE 14

<i>Occupations</i>	<i>Men</i>	<i>Percentage</i>
Agriculture	3,586,000	45.30
Industry	2,338,000	29.44
Commerce	842,000	10.60
Domestic service	23,600	0.30
Liberal professions	212,000	2.62
Mines and quarries	168,400	2.11
Public services	222,000	2.78
Transport	543,000	6.85
	<hr/> 7,935,000	<hr/> 100

The number of Frenchmen called to the colors during the war, 7,935,000 (colonials omitted), represents 20 per cent of the total population of 39,700,000. But the proportion becomes very differ-

ent when calculated on the number of active male workers. This number being 12,644,000, the proportion becomes one of 62.7 per cent, indicative of a truly prodigious effort. The percentage however requires some rectification, for during the war five new classes reached the military age, and we should allow in the total numbers of the several industrial groups for the five yearly contingents of young men who reached that age.

We will now indicate the proportion of losses suffered, at various periods of the war, by the several industrial groups.

We have seen that these losses in all were as follows :

Killed and missing (officers excluded)	1,347,000
Taken prisoners	506,000
Discharged seriously wounded	800,000

These would be distributed over the professional groups in accordance with the table showing the proportions mobilized, if there had been no temporary exemptions. But the considerable number of exemptions granted at different times completely modified the proportion of combatants, and in this respect the war may be divided into four periods.

1. *From 1st August to 1st December 1915.* The losses amounted to 664,000 killed and missing, 255,000 taken prisoners and 402,000 discharged, and these were distributed over the occupations approximately in proportion to the numbers mobilized in the several occupations. But it was not so in the second period, for from the spring of 1915 until May 1916 factory hands and miners were gradually exempted.

2. *From 1st December 1915 to 31st December 1916.* There were then 2,800,000 combatants at the front, from among whom there had just been drawn by temporary exemptions 500,000 artisans and 50,000 miners. As the number of combatants remained constant, these drafts had to be made good by the other occupations. During this second period the losses, amounting to 271,000 killed and missing, 104,000 taken prisoners, and 104,500 discharged, were distributed among the occupations in the following proportions :

Agriculture	58.32 per cent	Liberal professions	3.37 per cent
Industry	11.59 per cent	Transport	8.80 per cent

3. *Year 1917.* During this third period there were provisionally exempted, from the end of 1916, 180,000 agriculturists, 40,000 factory hands, and 40,000 railway-men who were restored to the transport service to accelerate the disembarkation of the American army. At the beginning of 1917 there were 2,900,000 men at the front, and during this third period the losses were 139,000 killed or missing, 53,000 taken prisoners, and 84,500 discharged. The proportions borne by the occupations were as follows:

Agriculture	52.9 per cent	Liberal professions	4.78 per cent
Industry	10.2 per cent	Transport	7.42 per cent
Commerce	19.4 per cent		

4. *Year 1918 and losses ascertained after the Armistice.* At the beginning of 1918 another 20,000 artisans, 27,000 railway-men and 13,000 miners were withdrawn. The losses were 273,500 killed, 94,500 taken prisoners and 149,000 discharged.

The total losses suffered by the several occupations were as follows:

Agriculture	673,700	Liberal professions	71,070
Industry	267,400	Public services	55,240
Commerce	196,720	Transport	99,240

It is to be noted that the liberal professions lost 71,070 men, whereas the proportion they bore to the total population should have given only 34,000. They sacrificed, in killed alone, 33 per cent of the number mobilized. Agriculture lost 673,700 men, whereas 573,000 would have been its normal proportion.

Temporary Exemptions and Furloughs.

The constantly increasing difficulties encountered by commerce and industry gave occasion to many petitions and resolutions in favor of the grant of temporary exemptions and furloughs; they were sent in by various bodies, notably by the mixed commissions for the maintenance of national industry, and they related to different classes of workers, belonging both to war industries and to other industries, to specialists and others, to foremen and managers. We thus find from divers departments applications for skilled workmen for hosiery manufacture, for wood-cutters and men to bark

trees, for porcelain makers, for viticulturists, for electro-chemical specialists, etc., and, from most departments, for harvest hands, to be taken from the oldest classes of the territorial reserve, or from the auxiliary services, etc., etc.

We have seen that down to the 30th June 1915, France had succeeded in adding 2,887,000 men and then a further batch of 2,740,000 to the 817,000 men of the active army. This great and almost immediate effort was designed to secure a rapid decision through numerical superiority. But about the summer of 1915 there was a change of policy. As the war, it was now recognized, must prove a long one, Government sought to introduce method into the process of calling men up, to economize personnel so as to employ it in developing the material engines of warfare (guns, explosives, military metallurgy), and the technical formations; attention was also paid to the maintenance of the country's economic life.

The Dalbiez law, as was mentioned above, allowed the recall from the colors of specialist workmen, so that in a few months some 550,000 men left the army.

In 1916 the pressure of economic needs increased, but it was only when the agricultural problem became vital in 1917, more in consequence of the submarine warfare than of the prolongation of hostilities, that it was decided to restore a few men to the economic processes of the country and notably to agriculture. From April 1917 to January 1918, 300,000 agriculturists were returned to the land, 32,000 men to the mines, 3,000 men to navigation, 8,000 men to the railway companies (to expedite the landing of American troops), and 5,000 men to educational services.

Table 15 gives a distribution of the men mobilized during the war, showing those drafted to factories and to agriculture, together with the temporary exemptions, furloughs, etc.

Temporary exemptions were liable to grave abuse, if granted without discrimination: it would not have done to find old experienced workmen remaining in the army zone while raw young hands were leaving the trenches. The Government, powerfully supported by public opinion, put a stop to irregularities: only men over 41, or auxiliary service men over 35, might be taken for employment in the interior. Economic committees, set up in each department, co-operated with the military and administrative authorities to develop

and regulate the supply of labor that the farms and factories so urgently needed. In this manner exemptions and furloughs contributed greatly to make it possible to run flour-mills, sugar-factories, gas-works, potteries, glass-works, and electric power stations, to spray vines, etc.

It was only late in the day that the fathers of large families and men who had had several sons or brothers killed received some measure of protection: fathers of six children were demobilized; fathers of five children, if over 42, were employed in the interior; fathers of four or five children, if between the ages of 36 and 42, were sent to serve in the rear. Men who had had three brothers or two sons killed were treated in the same way as fathers of four children.

The old classes of the frontier zone, which had been mobilized on the 1st August 1914, after taking part in the heaviest fighting and being retained beyond their period of service, were partially released only under the imperative pressure of the agricultural crisis: and when Clémenceau, on coming to power, had occasion to fear a reduction of army strength, his first care was to recall the old classes to the colors.

All this shows the extent to which economic needs had to be subordinated to military needs.

Unemployment and Official Employment Agencies. The Refugees.

We have stated that only 50 per cent of industrial establishments remained open immediately after the mobilization, and that out of every 100 workers only 34 remained at work. We also explained that allowing 25 per cent for the men mobilized, the proportion of pre-war workers unemployed at this period was 40 per cent. The regions most affected were those nearest the front, together with Paris, the center of the luxury trades and of building, which suffered in a special degree.

In order to relieve without delay this vast crowd of unemployed—as many, at one moment, as 500,000 to 600,000 in the department of the Seine alone—Government decided to grant them subsistence allowances, such as were given to the wives of men mobilized. By circular of the 20th August, the President of the Council directed that Relief Funds should be established in the towns and, in special cases,

in the departments, where unemployment was prevalent. These were subsidized by the State to the extent of 33 per cent of their expenditure. Such organizations as had previously existed in France were quite inadequate for the distribution of this relief: co-operative and trades-union benevolent funds worked well, but their resources were insufficient; they were able to distribute only 200,000 francs in all to their members during the first year of the war. Municipal Relief Funds in the various towns carried out the whole of the work: 77 such funds were created, and 74 of them distributed within one year 95 millions of francs (of which the State bore one-third). But as unemployment diminished rapidly, the estimated expenditure for the second year was only 45 millions; from 12 millions a month in 1914, the expenditure fell to 4 millions a month in January 1916. It remained at this figure for some time because relief was continued, on grounds of humanity, to men incapacitated from work (the old, the sick, and the infirm) and to women who had fallen into poverty before the war and had been unable to retrieve their fortunes (charwomen, seamstresses, artists, teachers, etc.). At a later date the expenditure diminished considerably.

In 1914, from 21st August to the 31st December, the expenditure authorized on the budgetary credit for the relief of unemployment amounted to 12,144,931 francs. Of this sum the city of Paris received 9,695,404 francs or 80 per cent, being 27.25 per cent of the expenditure incurred by it (35,574,479 francs); not 33 per cent, because the Government subvention applied only up to a maximum expenditure laid down by the law. The greatest amount of relief paid in Paris was during October, although unemployment had been most acute in August, because many unemployed did not at first apply for relief. The average numbers of unemployed recorded in Paris are given in Table 16.

TABLE 16

<i>1914</i>	<i>Unemployed in receipt of relief</i>
August	168,352
September	278,047
October	293,824 (maximum)
November	278,592
December	243,939

In the remainder of France the Relief Funds were less promptly organized and the figures of relief are not instructive.

For 1915 and the following years we give below only summary figures; fuller details will be found in the volume dealing specifically with the question of unemployment. We are concerned here merely to bring out the principal changes that developed in the industrial situation. We give the figures for Paris separately, not only because that city published very detailed and instructive statistics, but also because unemployment seriously affected only Paris and a few large towns.

In 1915 the average number of unemployed in receipt of relief, which was 225,000 in Paris in January, fell successively to 150,000 in May, 100,000 early in October, and 90,000 in December. For the whole of France the number fell from 300,000 in January to 105,000 in December.

In 1916 the number of unemployed in receipt of relief in Paris fell from 89,000 in January to 34,000 in December; and for the whole of France from 105,000 in January to 42,000 in December.

In 1917 the number of unemployed relieved in Paris fell from 34,000 at the beginning to 15,000 at the end of the year, the latter representing an incredibly low rate of unemployment. For the whole of France the number dropped similarly from 39,000 to 17,000. In 1918 the figures of unemployment remained extremely low, and it was only in 1919, at the moment of demobilization, that there was some recrudescence; but it was neither prolonged nor acute, and the relief funds had no difficulty in coping with it.

As regards expenditure, the monthly outlay in Paris, which had been about 8 million francs early in 1915, dropped to 3 millions at the beginning of 1916, to 600,000 francs at the beginning of 1917, and to about 100,000 francs at the end of the same year. For the whole of France the expenditure fell in the same period from 8½ million francs to 330,000 francs a month. The total expenditure from August 1914 to the end of 1919 (including, that is, the period of demobilization) may be estimated at 196,985,345 francs. Of this the State subvention to the end of 1919 furnished 72,824,521 francs (12,275,715 francs for 1915, 7,628,032 francs for 1916, and 2,912,101 francs for 1917).

But another category of unemployed, the refugees, presented a special interest. Flung back by the invasion from the northern and eastern provinces and from the whole of Belgium, they poured in in thousands and even in hundreds of thousands. They were particularly deserving of sympathy, not only because they had no work, but also because they were entirely devoid of resources, having sacrificed everything in the national cause. Useful and salutary as had been the relief of the local unemployed, the relief of the refugees was an imperative duty. Relief was accordingly granted to them, and it was moreover decided that this relief should not be withdrawn completely even when the recipient had obtained work. These unfortunate people were well entitled to this small concession, destitute as they now were of habitations, spare clothing, and savings.

According to statistics published by the Ministry of the Interior, the numbers of refugees in receipt of relief at the 31st October 1915 in the whole of France was as follows:

French	437,143
Belgian	154,298
Alsatians and Lorrainers	10,447

or in all 601,888. There were in addition 283,661 refugees not receiving relief, making up a grand total of 885,549.

These refugees (and this is the point at which they touch our subject) furnished French industry with an additional supply of labor. It has been said that the refugees did not take readily to work: if this was true of some, it was not true of the mass. But these men were dispirited and were constantly counting on returning to their homes; and it frequently happened that the only work they found to do was unfamiliar to them, out of keeping with their habits, and unsuited to their capacity. Nevertheless, whereas there were still in December 1914 70,000 heads of families, representing 200,000 refugees, on the lists of unemployed, by January 1916 the number had dwindled to between 20,000 and 25,000 heads of families, representing 60,000 refugees. Among the refugees from the north and from Belgium there had been found, as early as 1914, 8,000 miners, 12,500 metal workers and 6,000 agriculturists, a valuable contribution to the labor supply. In the department of the Seine alone there

were among the refugees 11,000 men trained to various callings, 4,000 in the Meuse, 2,000 or 3,000 in several other departments. The refugees who continued without work were in reality unemployed, most of them too old or incapable.

The payment of allowances to refugees cost the State, in 1914 nearly 30 million francs; in 1915 215,500,000; in 1916 236,700,000; in 1917 340,000,000; in 1918 687,500,000; in all from 1st August 1914 to 31st December 1918 more than a milliard and a half of francs.¹

Finally, we will touch briefly on the organization of public employment agencies, due in the first instance to the urgent need of finding employment for refugees and unemployed, and afterwards greatly developed with a view to obtaining promptly the supply of labor required by munition and other factories and by agriculture. We shall also mention summarily the special organizations for recruiting and placing foreign and colonial labor, which played so important a part in the industrial economy of the war.

Before the war, arrangements for placing industrial labor were very little developed. Places were found chiefly by means of personal inquiry through connections. There were also the employment agencies of trade associations, whose activity however was, generally speaking, not very great. The best trade agencies, moreover, and all the private agencies charging fees—the latter were of some importance—found places only for domestic and hotel servants, and for workmen and employees in the food industry. It is true that a law of 1904 had provided for the establishment of municipal agencies in all towns of more than 10,000 inhabitants; but these agencies as a rule existed mainly on paper, and most of them, moreover, dealt only with employment of the kinds above mentioned; 165 towns possessing a more or less theoretical agency used to find annually 100,000 places, while a single well-organized agency, that of Nancy, found 12,000.

So far as the requirements of industrial labor were concerned, a system of employment agencies remained to be organized. A central employment agency for unemployed and refugees was estab-

¹ In 1919 841,754,720 francs.

lished in Paris in November 1914. It exerted itself vigorously and was supported by the great associations of employers, mine-owners, ironmasters, building employers, etc., and by a few trades-unions, those of the printers and binders, engineers, and tailors; the railway companies also co-operated. Shortly after, the Under Secretary of State for Ordnance founded a labor bureau, primarily to discover specialist workmen who had been mobilized and restore them to factories, but also to find women for employment on munitions. Then the Minister of Agriculture set up an agricultural labor service, which showed great energy in dealing in particular with temporary exemptions, furloughs, the distribution of foreign and colonial labor, and prisoners of war.

A general systematized organization was needed, and the scattered municipal agencies did not provide this. Departmental agencies were set up in 1915, and then regional agencies, and by this means an organization adequate to the requirements of this extraordinary period was finally secured, central office, regional, departmental, and municipal agencies. Co-operating with these were the Central Service for Foreign Labor, the Colonial Labor Service, and the Agricultural Labor Service.

From the 5th November 1914 to the 5th January 1915 the Central Office found employment for only 14,850 persons, laboriously sought out from among the refugees; and in the twelve months to the end of October 1915, for only 48,500; and this mainly through the Railway Companies, the Committee of Ironmasters, the Committee of Mine-owners, etc. As the refugees found employment, the Central Office and these central bodies became powerless to assist; but the departmental agencies on the contrary became efficient organs for placing and distributing workmen. The following are the numbers of places found from 1915 to 1919 by the departmental and regional agencies, and subsidiarily by the Central Office, whose functions were now confined to co-ordination.

1915	35,618
1916	96,687
1917	172,682
1918	334,280
1919	794,864

Foreign and Colonial Labor.

Every possible source of labor had, in the circumstances, to be utilized, and the authorities naturally turned their thoughts to foreign labor, which had already been largely employed before the war to develop, in spite of the low birth-rate, the country's industrial resources. Considerable numbers of workmen had, for instance, been brought from Italy to the iron-mines and metal works in the Meurthe-et-Moselle; and many coal-mines and other industrial undertakings recruited labor in Algeria, Belgium, Poland, and Luxemburg.

Many departments in the course of the war made applications for foreign labor and a service had to be created in 1916 in the Ministry of Munitions to supervise its recruitment, the conditions of its admission into France and its employment.

The total number of workmen introduced by the 'Foreign Labor Service' from the 1st July 1916 to the 1st January 1919 and kept under its supervision while in France was 81,897. This figure was composed of

Portuguese	22,849
Spaniards	15,212
Greeks	24,274
Italians	5,486
Poles	1,306
Various (including Alsatians, Lorrainers and North Africans)	12,770

These workmen were all assigned to industrial employment. The number does not include such workmen as may have entered France without passing through the depots; they are unlikely to have been many, in view of the active watch maintained in war time. Nor does it include the Belgian refugees whose numbers were given in an earlier paragraph; nor military workmen, Italians in particular, who were employed not only in the zone of the front but sometimes in munition factories.

Although we are specially concerned with industry, we will mention, because of the connexity of all these questions, the number of agricultural laborers (including their families) whose introduction

into France was supervised by the Agricultural Labor Service of the Ministry of Agriculture.

Down to the 1st January 1919:

Spaniards and Portuguese	146,446
Italians	2,225
Various	6,100

of whom 119,539 were men, 22,342 were women, and 12,890 were children.

In 1919 and 1920:

Spaniards and Portuguese	96,526
Italians	12,284
Belgians	20,532
Poles	3,693

or 133,035 in all, men, women, and children.

There was further a Colonial Labor Service at the Ministry of War, charged with the duty of recruiting directly and importing colonial and *Chinese* labor. These workmen, who were intended specially for industry, were subjected to a special system of discipline and organization, and at the time of the Armistice numbered 140,409:

34,536 Algerians	42,757 Indo-Chinese
12,695 Moroccans	3,469 Malagasies
12,357 Tunisians	34,595 Chinese

From October 1917 the Foreign Labor Service had been transferred to the Ministry of Labor; its activity was checked by the Armistice. From fear that the soldiers would find themselves without work on demobilization, the frontiers were closed and foreign workmen—particularly the Spaniards, Portuguese, and Greeks—were repatriated. But France, which had already suffered from a shortage of men before the war and whose population had since been decimated, soon felt the urgent need for labor. The prisoners of war were moreover to be liberated after the ratification of the Peace Treaty, and the question of their release and replacement had to be dealt with in June 1919.

The Ministry of Labor, in co-operation with the other Ministries concerned, applied the experience that had been acquired to

the re-organization of the Foreign Labor Service, so as to meet the various demands, and concluded treaties on the importation of labor with Poland, Italy, Portugal, and Czecho-Slovakia.

*Women's Labor. Increase in the Number of Female Workers;
Their Employments.*

At the third of the periodical inquiries (July 1915) into the working of industrial and commercial establishments, Labor Inspectors were able to report that four groups of industries—Food, Chemicals, Metals, Transport and Storage—showed a 'negative' proportion of unemployed, that is to say that the number employed in them at that date, *plus* the number of their mobilized employees, exceeded the number employed in July 1914. Many workers who had not followed these occupations before the war now adopted them, and these new workers included a large number of women. In July 1915, 30,000 women were already employed in private munition factories, making shells, parts of rifles, bombs, explosives, cartridges, aeroplane parts, fuses, and other small articles. They were engaged on such work as turning, boring, countersinking, etc. In June 1915, 14,162 women were employed in the State Ordnance Factories, principally on checking (though at St.-Étienne they were already working at machines). On the 1st January 1916, 26,903 women were working in the Ordnance Factories, and 83,007 in private factories under the Ordnance Department, in all 109,910 women.

An inquiry carried out in August and September 1915 relating to all classes of establishments (not only those concerned with national defense) enabled a detailed list to be drawn up by groups of industries of the kinds of work in which women came to participate, although they had not been employed in them before the war. The list became so long that there may be said to be no industry to which female labor did not contribute. As will be seen from the monographs in Part II, women undertook varied forms of work in all branches of industry, even work of a very fatiguing and complicated kind, such as required a robust type of labor (management of large printing-presses, mechanical saws, filling of shells, handling weights with the assistance of machinery, etc.). According

to the reports of Labor Inspectors, the new workers, though less accustomed to factory work, less steady and assiduous than men, nevertheless proved satisfactory; the aptitude that they showed for most of these duties was sufficient; sometimes even remarkable, where the operations required dexterity and attention. It is, however, difficult to compare the work of women with that of men, for the two are generally not precisely the same.

Employers modified the organization of their factories and their processes to make employment easier. They minutely subdivided the work, organized mass production, and assigned to women tasks of a strictly limited character, reserving for men the work that required a long apprenticeship; for instance to every four or five lathes worked by women they assigned a man as fitter. They modified the composition of squads, and replaced hand-driven by motor-driven machinery.

Under the pressure of necessity, the employment of female labor continued to develop after 1916, not only on work requiring skill and attention, but also on heavy and fatiguing jobs. A thorough inquiry, carried out in July 1917, furnished the following statistical results as regards the number of women employed in various establishments. In normal times the 52,278 establishments covered by the inquiry employed 1,524,959 workers, of whom 1,037,485 were men and 487,474 were women. The latter number fell in August 1914 to 199,107 and rose again to 418,579 by July 1915; to 546,701 in July 1916; to 600,759 in January 1917; and 626,881 in July 1917. The number of women employed, after falling to 40.8 per cent of the normal, rose to 86 per cent in July 1915, then exceeded the normal by 12 per cent, 23 per cent, and in July 1917 by 29 per cent.¹ The industries where the increase was most considerable were

¹ Another inquiry into women's work during the war, carried out by Labor Inspectors in January 1920, yielded for the years 1916 and 1917 figures somewhat different from the above. Taking the number of women employed before the war in 39,998 establishments that were the subject of inquiry as = 100, the following index-numbers represent the women employed in the same establishments at various dates: August 1914, 47; January 1915, 60; 1916, 79; 1917, 93; 1918, 97; 1919, 91; 1920, 103. The maximum extension of women's labor is substantially below that shown by the inquiry of 1917. The differences are due, for the greater part, to metallurgy and the working of ordinary metals, in which the index-numbers yielded by

naturally those working for national defense. Out of 15 groups of industries there were eight where the number of women employed in July 1917 exceeded the normal; for every hundred women employed before the war, Metallurgy was employing 913, Transport 454, Chemicals 164, Wood 154, etc. The other seven groups showed a slight reduction.¹ (See Appendix IV.)

the inquiry of 1920 at the above dates are: 43, 103, 228, 364, 413, 285, 240.

The divergencies may be explained as follows:

(1) The inquiry of 1920 comprised the whole of Lille and Nancy and the liberated regions, so that its results are not comparable with those of 1917. The additional establishments comprised in the later inquiry had been only partially employed during the war, and consequently lowered the average of the whole; this particularly applies to metallurgy, the principal establishments of that industry being located in the liberated regions.

(2) The objects of the inquiry were not the same in 1920 as in 1917. In 1917 Inspectors visited especially the numerous factories working for national defense, whose activity, particularly in regard to metallurgy, was great. In 1920 they were interested also in those factories which, having suffered during the war, were then recovering. This very natural difference of procedure may have had an important effect on the resulting figures.

(3) A subsidiary factor is that the figures collected in 1917 by Inspectors who were closely following industrial developments are certainly more trustworthy than those drawn up after the war by Inspectors working, for the most part, in districts new to them.

For these reasons, engaged as we are on a description of industrial activity during the war in the regions that were not invaded, we must accept the results of the inquiry of 1917 in preference to those of 1920. We may however perhaps draw this conclusion from the latter, that the figures of 1917, especially as regards metallurgy, comprise an abnormal proportion of factories working for national defense. Personally, after weighing the index-numbers, I should be inclined to lower the maximum for metallurgy in 1917 to 750.

¹ These figures taken by themselves are apt to give an exaggerated idea of the part played by women's labor. Other factors must be borne in mind. Consider for example metal work. It appears that nine times as many women were employed in it in 1917 as in 1914. But on the one hand the proportion of women employed in it in 1914 was only $6\frac{1}{2}$ per cent; and on the other the total personnel of the industry, men and women, increased from 100 to 167 per cent. So that the $6\frac{1}{2}$ in 100 merely became 59 in 167 or 35 per cent. If, as shown in the preceding note, the coefficient 9 is exaggerated and $7\frac{1}{2}$ is a more probable figure, we should find that the staff which comprised $6\frac{1}{2}$ per cent of women in 1914, comprised 30 per cent at the maximum.

Table 17 enables us to compare the total number of men and women employed at various periods in the establishments under consideration, the proportion of men to women, and the proportion of each as compared with the pre-war period.

TABLE 17

<i>Period</i>	<i>Men</i>	<i>Women</i>	<i>Total</i>
Pre-war	1,037,484	487,474	1,524,959
August 1914	319,622	199,107	518,729
July 1915	632,195	418,579	1,050,774
July 1916	834,165	546,701	1,380,866
July 1917	932,512	626,881	1,559,393

<i>Period</i>	<i>Percentage</i>			<i>Percentages as compared with pre-war</i>		
	<i>Men</i>	<i>Women</i>	<i>Total</i>	<i>Men</i>	<i>Women</i>	<i>Total</i>
Pre-war	68.1	31.9	100	100	100	100
August 1914	61.7	38.3	100	31	41	34
July 1915	60.2	39.8	100	61	86	69
July 1916	60.4	39.6	100	80	112	91
July 1917	59.8	40.2	100	90	129	102

The three last columns of this table indicate that the total staff of the establishments referred to, after having fallen to 34 per cent of the normal in August 1914, returned to the normal in July 1917. During the same period, while the male staff increased from 31 per cent (August 1914) to 90 per cent (July 1917) the female staff increased from 41 per cent to 129 per cent.

We come next to the number of women employed in certain specific services. On the 1st January 1918 the proportion of women to the whole staff employed in each of the following services was:

In mines	12.8 per cent (women and children)
In engineering and commissariat services of the army	21.5 per cent
In state maritime services	21.2 per cent
In public health services	47.3 per cent
In railway companies	14.3 per cent

The proportion of women to total staff employed in State and private munition factories at quarterly dates in 1916, 1917, and 1918 is given in Table 18, the number employed in January 1916

being taken as = 100. For every 100 women employed in January 1916, there were 361 in January 1918. The proportion of women to total staff rose in the same period from 14 per cent to 23 per cent (it had been only 11.25 per cent in July 1915).

TABLE 18

	<i>Index-number of women employed in</i>			<i>Percentage of</i>
	<i>Private munition factories</i>	<i>State munition factories</i>	<i>All munition factories</i>	<i>women employed to total staff</i>
January 1916	100	100	100	14.0
April 1916	178	123	162	18.0
July 1916	240	175	221	21.4
September 1916	289	196	263	22.7
January 1917	358	241	292	24.0
April 1917	366	264	337	23.7
July 1917	378	278	349	24.0
September 1917	381	277	351	25.0
January 1918	388	295	361	23.0

We may finally note that in the various services of the Ministry of War there were on the 1st January 1918 132,468 women employed as secretaries, clerks, shorthand-writers, charwomen, etc.

We may accordingly conclude that women played an important rôle in France during the war; they contributed to the economic life of the nation by undertaking duties that were thought to be beyond their strength, and showed themselves capable of replacing men in a large number of occupations, even of the most arduous description. Not only was the laborious work of the farm almost exclusively carried on by old men, women, and children, but women engaged in the most varied occupations: they became bakers, wheelwrights, masons, slaters, gang foremen; and in Paris, inspectors, conductors, and drivers of trams. Above all they contributed largely to national defense, whether as hospital nurses—in which capacity we are not here concerned with them—or by replacing military labor wherever possible (in staff and commissariat offices, medical formations, etc.), or by coming in large numbers to work in munition factories, undeterred by the prospect of heavy toil and the risk of accidents.

The Disabled.

The disabled formed a category of workers not only special in character, since their wounds had often considerably reduced their capacity for work, but also of peculiar interest, in that their incapacity had been occasioned in the service of their country. Their number was great: out of 8,410,000 mobilized men, not only were 1,383,000 killed, but 2,800,000 were wounded, one-half of these wounded twice, and more than 100,000 returned to the firing line after three or four wounds.

Table 19 gives the numbers of disablement pensions granted up to 1920, for all ranks up to major, with the percentage of incapacity.

TABLE 19

<i>Per cent</i>	<i>Final pensions granted to March 30, 1920</i>	<i>Temporary pensions granted to April 30, 1920</i>	<i>Total</i>
10	2,059	56,665	58,724
20	3,064	92,390	95,454
30	1,120	78,088	79,208
40	455	50,013	50,468
50	346	32,675	33,021
60	14,915	24,468	39,383
65	41,553	....	41,553
80	40,829	6,086	47,515
85	5,164	5,635	10,799
<i>Total</i>	109,505	346,620	456,125

By the 1st April 1919, 300,000 disabled men had applied for pension, and of those already pensioned at that date, 41 per cent were agriculturists, 16 per cent industrial workers, 9 per cent tradesmen, 12 per cent building-trade workers.

But it had not been overlooked that these young disabled men might render valuable services if measures were taken to permit of it, and, in particular, if appropriate technical training were provided for them.

Two types of training establishment were required: (a) establishments dealing with *functional education*, where the wounded would receive special medical treatment, designed to restore a certain degree of vigor to their limbs; (b) technical schools properly

so called, where the wounded might learn a new profession, commercial, industrial, or agricultural, if they were precluded from following their old employment. For this latter purpose existing technical and trade schools were made use of, and new ones were started.

By the end of 1915 there were already 21 agricultural schools, 32 industrial or commercial schools, and some 40 municipal or private institutions of this kind. The 'National Office for the Disabled and Discharged,' which was definitely constituted by the law of the 2nd January 1918 with its headquarters in Paris, was placed in communication with local committees in each department, and valuable assistance was also rendered by the 'National Federation for the Help of the Disabled.'

Information was collected in the first quarter of 1916 by the Labor Inspectors regarding industrial and commercial employments actually occupied by disabled men, the employments offered to such men, and those noted as being capable of being filled by them. The data so collected indicate that disabled men were working in nearly all classes of occupation (other than heavy work such as mining and metallurgy) according to the nature of their disablement. Table 20 shows their distribution among the main industrial groups: it should be observed that the total of 617 does not represent the whole number of disabled men in employment, but only of such as the Inspectors had noted in the course of their inspections.

As the number of disabled went on increasing, an endeavor was made to improve the measures for finding them employment. The official employment agencies had kept careful records of the results of their efforts to find places suited to the physical condition and previous training of these men. The decree of the 26th February 1918 expressly laid on the agencies the task of finding, in collaboration with the departmental and local committees, employment for invalided soldiers, this decree being based on the law of the 2nd January of the same year, which had organized the National Office for the Disabled.

A circular of the Minister of Labor was in June 1918 addressed to employers, notifying them of the existence of an office for the placement of disabled men, and requesting them to communicate

their offers of employment to that office, and to inform it of the places in their employment already filled by such men.

In 1917 the employment agencies in the departments and those

TABLE 20

<i>Industries</i>	<i>Nature of disablement</i>								<i>Total</i>
	<i>Head</i>	<i>Eyes</i>	<i>Arm</i>	<i>Hand</i>	<i>Leg</i>	<i>Foot</i>	<i>ous</i>	<i>Unspe-</i> <i>cified</i>	
Food		1		1	1			4	7
Chemicals	1			1	4			2	8
Rubber, paper, printing, and binding	2	1	5	3	5	2	2	1	21
Textiles, clothing, etc.	1	4	7	3	19	2			36
Leather and wood		3 ¹	9	5	35	3	4	1	60
Metals	4	14	22	32	74	13	7	21	187
Stone-cutting, building				1	2				3
Pottery and glass	10		1	1				1	13
Transport and storage	1	12	11	13	15	6	3	13	74
Commerce	1	5	8	4	1		1		20
Clerks, accountants, supervision, and various	4	9	70	30	35	5	9	26	188
	24	49	133	94	191	31	26	69	617

of the Ministry of Munitions found places for about 12,200 disabled men and men discharged unfit; in 1918 the agencies of 64 departments found places for 10,944. Inquiries carried out in 1920 by the Employment Agencies with reference to 3,252 disabled men disclosed that 1,350 or 41.5 per cent had resumed their former employment, that 677 or 20.5 per cent had adopted an employment related to that which they had formerly followed, and that 1,235 or 38 per cent had been obliged to adopt an entirely new employment. A later investigation, in 1922, by the same agencies and relating to 4,192 disabled men resulted in showing that 38 per cent were pensioners incapacitated to the extent of more than 50 per cent;

¹ Including two completely blind.

and that 18 per cent had received fresh professional training. Of the agriculturists 60 per cent had resumed their calling, 20 per cent had gone to another occupation after fresh training, and 20 per cent had done so without fresh training. The proportion of agriculturists suffering from more than 50 per cent incapacity included in this inquiry was 45 per cent.

Prisoners of War.

Enemy prisoners of war, whose number increased yearly during hostilities, notably after the great offensives, were an important element in the supply of labor. They were at first not very numerous, but the total of prisoners captured by the French army finally amounted, in the north-eastern operations, to 421,655, and in the Near East to 81,078.

Their labor was resorted to at first with some circumspection, in order to prevent escapes and to avoid friction with the civil population. But under pressure of necessity, it was found impossible to dispense with this source of labor supply, composed of men in the prime of life, who moreover included specialists of exceptional skill; for instance clinical thermometers, such as French industry did not produce, were manufactured by German prisoners. As a result of numerous applications and resolutions on the subject passed by the mixed commissions in the departments, several thousand prisoners were, to begin with, allotted to particular districts (1) for agricultural purposes, especially at harvest time, and for wood-cutting; (2) for transport of goods and for earth-work (road-repairs); (3) for loading and discharging vessels at the ports; and (4) for various industries.

They were at first placed directly under the control of a Prisoners of War Commission; later, their employment was managed, jointly with that of exempted men and foreign and colonial laborers, by the interministerial labor commission sitting at the Ministry of Labor.

The following tables give the distribution of prisoners of war among the industrial groups at various dates and show the gradual extension of their employment. The years 1917 and 1918, when 208,000 and 306,000 prisoners were employed respectively, are specially interesting.

End of 1915.

Agriculture	{	Agricultural squads	19,870
	{	Forests	1,596
	{	Fertilizer squads	178
Public works	{	Quarries	1,546
	{	Mines	4,425
	{	Roads and bridges	433
Transport	{	Naval service	2,109
	{	Railway lines	3,354
	{	Ports	10,588
	{	Headquarter Staff (Transport Department)	1,498
Munitions	{	Factories	9,146
	{	Wood-cutting	802
	{	Wood centers	939
War Department	{	Engineers	2,314
	{	Commissariat	2,236
	{	Aviation	647
	{	Various services	2,248
	{	Regional workshops	242
<i>Total</i>			64,171

At the end of 1915 more than 20,000 prisoners were working on the land in squads, and more than 40,000 were occupied on work relating to national defense.

End of 1916.

Agriculture	{	Agricultural squads	32,488
	{	State forests	2,692
Public works	{	Railways, roads, and bridges	1,847
	{	Quarries	7,047
	{	Mines	5,257
Naval service			2,585
Headquarter staff (Transport Department)			30,382
Ordnance and Munitions Department			4,197
Engineers, Aviation			6,306
Various: Municipalities, gas-works, salt-pans			964
Temporary duties			257
Workshops and fatigues in prisoners of war camps			5,258
Orderlies to officer prisoners of war			641
<i>Total</i>			122,773

At the end of 1916, 35,000 prisoners were working on the land, and nearly 88,000 were contributing, under military direction, to various services. The Headquarter Staff employed 30,000 on transport alone.

End of 1917 and End of 1918 (Armistice).

<i>Interior zone—employed prisoners</i>		<i>End of 1917</i>	<i>End of 1918</i>
Agriculture	{ Agricultural squads	42,836	49,147
	{ State forests	2,579	2,131
	{ Fertilizer squads		754
	{ Land-drainage squads		144
	{ Food-supply squad		644
	{ Sugar factories	1,989	1,489
Public works	{ Military quarries	2,772	3,334
	{ Mines	11,902	16,142
	{ Roads and bridges	892	780
	{ Restoration of liberated districts	1,270	2,731
Maritime service	{ Navy	4,053	6,926
	{ Mercantile marine	352	1,539
Munitions	{ Factories	29,425	24,899
	{ Wood-cutting and turf-cutting	3,467	3,352
	{ Wood centers	2,291	3,444
	{ Distilleries	531	114
Transport	{ Railway lines	10,273	14,809
	{ Marine and river ports	22,611	24,408
	{ Headquarter Staff (Transport)	4,359	5,748
Engineering, Commissariat, Aviation		14,323	16,686
Various services (Health, Municipal, etc.)		884	5,893
Regional and local workshops, military depots		5,554	5,448
Prisoners of war in sorting depots, etc.		3,418	11,405
<i>Army zone—employed prisoners</i>			
Prisoners of war at disposal of Commander-in-Chief		42,301	104,077
<i>Total employed</i>		208,082	306,044

In 1917 and 1918 prisoners were employed on a large scale. It will be seen that they contributed indirectly to certain defense services (25,000 men in munitions factories and 24,000 in maritime and river harbors). In addition to the assistance afforded by them to agriculture, the considerable supply of labor that they furnished to the mines is deserving of notice (12,000 men in 1917 and 16,000 in 1918).

Regulation of Labor.

The majority of the laws that constituted the labor code and governed the relations of employers and employed at the moment of mobilization had to suffer exceptions and modifications under the pressure of events. The imperative need of meeting the requirements of national defense made a vigorous speeding up of work obligatory. By various circulars of August 1914, Labor Inspectors were instructed to interpret regulations with the greatest latitude; in order to increase production employers were allowed to exceed the normal hours of work, to organize a twelve-hour day, an eleven-hour day at least for women, and to suspend the weekly day of rest; and the workmen, from a spirit of patriotism, readily accepted these departures from the regulations. Soon, in view of the difficulty of obtaining the required supply of male labor, women and children began to be generally employed in occupations hitherto reserved for men, and this led to fresh breaches of the regulations: women and children were admitted to dangerous occupations (cartridge and shell factories, etc.), and were even, in exceptional cases, authorized to work at night.

But it was soon found that the continuance of these irregular practices was open to grave objection: employers who were in a hurry tended to abuse them. Above all, as a result of the continuance of the war, certain practices that might be tolerated for a few weeks or even months became in the long run detrimental to the health of the workers, and especially of the women and children. Accordingly attempts were made in 1915 and 1916 to limit and regulate the exceptions to labor regulations that had been tolerated at the outset, and inquiries were opened by the Ministries of Labor and of Munitions.

During the first quarter of 1916 an inquiry conducted in the departments of the Seine and Seine-et-Oise found that in general the precautions for the health and safety of the staff were satisfactory, and had even in some instances been improved as a result of the increase of female labor.

Measures for bettering the moral and material conditions under which women worked in the State munition factories were the subject of frequent discussions by the Committee on Female Labor.

At the instance of this Committee, instructions were given to the Controllers of Labor and communicated to the Labor Inspectors, laying down the limits to the night employment of women (women under 18 were not to be allowed to work at night; those between 18 and 21 were to be allowed to do so only temporarily and exceptionally; the effective period of women's night work was not to exceed 10 hours).

The Committee on Female Labor investigated the question of protecting maternity in respect to women employed in munition factories, and the Minister of Munitions directed the Controllers of Labor to draw the attention of employers to the recommendations of the Committee, recommendations based on resolutions adopted by the Academy of Medicine. The Committee likewise secured an inquiry in January-May 1917 into the crèches attached to factories and the rooms where babies could be fed while their mothers were at work. Finally it obtained in February 1918 an inquiry into the hours of women employed on national defense work.

In short, at the outbreak of war, the elasticity that was allowed in the labor regulations, the additional hours of work, night work, and the employment of children and above all of women, contributed greatly to the national output, especially in respect to munitions. Subsequently it was found possible, by the minute regulation of such irregularities as were tolerated, to maintain the health of the workers while securing an invaluable increase in the supply of labor.

CHAPTER III

THE NUMBERS EMPLOYED IN INDUSTRY, THEIR VARIATION, AND THE VARIATION IN INDUSTRIAL ACTIVITY

To study the changes in industrial activity, we must ascertain the proportion of workers employed, for the whole of the occupations taken together, in each of the districts under consideration.

The following, to begin with, is a summary on the broadest lines of the course of industrial activity during the war.

Out of 100 workers employed in July 1914, only 34 remained employed in August, the moment of maximum depression. In January 1915 the number at work recovered to 57; in January 1916 to 80; in January 1917 to 97; it was at its maximum (100 per cent) from July 1917 to January 1918, being then approximately at the peace-time level notwithstanding the drafts made by mobilization. It decreased a little in July 1918, owing to the necessity of reinforcing the combatant units; it decreased further on demobilization with the suspension of war manufactures, and rose sharply in January 1920. At the end of 1920 a world-wide industrial crisis arose, and continued unabated in 1921.

We shall now study these changes in detail with the help of the periodical returns of the Labor Inspectors. We must begin by explaining how their inquiries were conducted.

The numerous data collected by the Labor Inspectors relate to industrial and commercial establishments under the several groups of industries and are shown under very large districts. The industrial groups were those adopted for the purpose of the census. The districts were the eleven inspectorial districts whose headquarters are: Paris, Limoges, Dijon, Naney, Lille (for the Nord and Pas-de-Calais), Rouen, Nantes, Bordeaux, Toulouse, and Lyons. As Lille was in the hands of the Germans, we shall generally speak of the fifth district (Nord and Pas-de-Calais) as the Calais district.

It should be pointed out that *Mines* and *Transport*, which will be dealt with in separate volumes, are not included in the Inspectors'

returns nor in the conclusions drawn from them; the Inspectors were concerned only with the manufacturing industries. We shall however give, independently of their reports, some instructive figures relating to Mines.

The Inspectors' returns were submitted to the Ministry of Labor, at first every quarter (until July 1916), then half-yearly. There were fourteen returns in all, four in 1915, three in 1916, two each in 1917, 1918, and 1919, and one in 1920; the first dealt retrospectively with the period from July 1914. It will be observed that the Inspectors did not on each occasion give information relating to all the factories in their districts, but only to such as they had been able to visit during the preceding period. If all factories, therefore, were not included in the statistics, accurate information was available in respect of a large and well-defined group.

As between one report and the next, the factories serving as a basis to their conclusions may not have been the same; or more exactly, the groups of factories serving as the basis of two successive returns included partly the same factories and partly different factories. In each return the Inspector gives, in respect of the factories that he has visited, the number at work and the number closed down; he indicates for these factories the number of staff employed at the date of the last inspection and at the dates of preceding inspections. From these data he deduces, in respect of the factories visited in the last period, the general course of industrial development since the outbreak of war. Although, by reason of the large number of factories inspected in each period, the statistics prepared at the close of that period have an independent value, sufficient to indicate the changes in industrial activity in the district, yet some doubt might be felt as to the accuracy with which they measure this activity. When, however, we compare together the several tables recapitulating the data relating to each district and each industrial group obtained at the successive enquiries, we find a sufficient measure of agreement between them to justify our confidence in them. Nevertheless, for the sake of greater accuracy, we have taken for each period the mean of the figures relating to that period given by the successive returns.

We have not, however, taken these averages on the fourteen returns, but only on the first twelve, the last of which (1st January

1919) sums up the final months of the war. The liberated region is included in the return of the 1st July 1919, and the figures of the Lille and Nancy districts comprise not only the non-invaded territory but the whole of those areas; so that in respect of those two districts the figures of the 13th and 14th returns are not in any way comparable with those of the earlier returns. When we make use of these two last returns, we shall either consider them separately, or if we calculate any average on the figures of all the fourteen returns it will be only in respect of the nine uninvaded districts and not of the whole of France.

We shall not reproduce the original tables given in the returns: their absolute figures, as we have explained, do not relate to the whole of the factories in one district, and we have corrected the index-figures they supply by means of averages calculated as indicated above. The table in Appendix IV shows the index-numbers, taken from the successive returns, which represent, for each period, the total amount of employment for the whole of France. This table enables one to judge the extent of the variation in the figures relating to the same period furnished by the successive returns and the degree of their accuracy.

The original tables given in the returns and the table in Appendix V have enabled us to summarize in two other tables, Appendices VI and IX, all the data furnished by the returns. Appendix IX gives *for each of the fifteen industrial groups* the index-numbers representing the proportion of personnel employed at the dates of the first twelve returns to the personnel employed in 1914. Appendix VI gives similar index-numbers *for each of the eleven districts*. In the same Appendix, by taking the figures of all the fourteen returns in respect of only the nine uninvaded districts, we have been able to indicate the general tendency of the post-war period. Our first comments will relate to this latter table (Appendix VI).

It will be observed to begin with that the districts which suffered the greatest disorganization at the outset of hostilities were those of Nancy, where the proportion of staff that remained in employment was only 10 per cent; of Dijon, where it was only 25 per cent; of Paris, where it was 29 per cent, and Toulouse, 27 per cent. It is difficult to explain why this last district occurs among those most

disturbed, since it was far from the military front and from the line of movement of troops.

On the other hand the districts that at first maintained the highest degree of industrial activity were those of Bordeaux, Limoges, and Nantes, where 49, 46, and 45 per cent respectively of the personnel remained in employment.

Appendix VII indicates for successive periods of the war, (1) the three districts showing the lowest degree of industrial activity, and (2) the three showing the highest degree of industrial activity, as compared with 1914.

Classed according to their average industrial activity during the whole of the war, in respect particularly of manufacturing industries and excluding Mines and Transport, the eleven districts assume the following order (the numbers are the percentages of personnel employed as compared with July 1914): Rouen, Bordeaux, 91; Lyons, Toulouse, Paris, 87, 86; Calais, 81; Limoges, 77; Marseilles, 74; Dijon, 73; Nantes, 64; Nancy, 52.

But whereas Bordeaux remained throughout one of the three most prosperous districts, and Nancy one of the most disorganized, Toulouse rose slowly from the lowest rank to the highest, and Nantes followed the opposite course. These changes may be traced in Appendix VII.

Appendix VII also indicates the districts in which the figures of peace-time employment were exceeded and the periods when this exceptional activity occurred. It was due, of course, to the manufacture of explosives and other munitions, and instances of it are to be seen in the districts of Rouen, Bordeaux, Toulouse, Lyons, Paris, and Calais.

If the reader desires to follow the course of industrial progress in 1919, Appendix VI will enable him to do so, but the districts of Nancy and Lille are excluded from the calculation. From January 1919 to January 1920 progress was chiefly made by the Lyons district; Toulouse, Rouen, and Dijon were also better; no district showed a decline. As regards Nancy and Lille, returns of January 1920, taken separately, show a rapid improvement in the index-numbers of employment: Nancy from 48 to 74 and Lille from 26 to 84: but these figures confuse the industrial activity of the regions that were not invaded with the restoration of the liberated areas. We

may state in this connection that the factories that had been in the enemy's hands were on the 1st April 1920 employing 35 per cent of their pre-war staff.

In 1920, after the somewhat hesitating progress of 1919, industry entered on a period of great activity and prosperity, which terminated in the last months of that year.

We now come to the principal changes in the extent of employment viewed from the standpoint of the industrial groups. As already stated, Appendix IX covers the whole of French industry, with the exception of Mines and Transport, which will be dealt with in other volumes. But no general survey of French industry during the war would be complete and instructive that failed to indicate by a few significant figures and illustrations how the coal-mining industry fared during this period. Appendix VIII gives very briefly in regard thereto figures analogous to those contained in Appendix IX. If the numbers employed in July 1914 in the coal-mines that were not subsequently occupied by the enemy be taken as = 100, we see that those numbers increased during the war by nearly 70 per cent; but it also appears that this increased personnel represented only 82 per cent of the total number of coal-miners employed in the whole of France before the invasion. The loss of one-half of the mines was not made good by the more intensive working of the remainder. It is well known moreover that special efforts were made to obtain men both from the army and from civil life to work in the mines.

As, moreover, for the purposes of French industry as a whole, output of coal is as important as the number of miners employed, we give in Table 21 in millions of tons the output and consumption of coal in France, before and during the war, and after the war.

TABLE 21

<i>Year</i>	<i>Output</i>	<i>Consumption</i>
1913	41	62 (Whole territory)
1915	19.5	39 (Territory not invaded)
1917 (maxima)	30	46 (Territory not invaded)
1918	26	41 (Territory not invaded)
1919	22	44 (Whole territory, including Alsace and Lorraine)

It must be borne in mind that the figure of 62 million tons, representing the pre-war coal consumption, includes that of the Nord, and of the highly industrial departments of the frontier.

For metalliferous mines, we may add the following summary figures: total numbers employed in 1914 (1st half), 31,800; 1915, 7,800; 1917, 13,400; 1918, 12,400; 1919 (including the Moselle), 26,700. The index-number of men employed in the mines not occupied by the enemy rose from 100 in 1915 to 172 in 1917, while that of the total number of miners working in metalliferous mines in French employment fell from 100 (1st half of 1914) to 42 in 1917.

We will now briefly analyze the changes in industrial activity as shown in the several industrial groups.

Immediately after the sudden check caused by the mobilization, there was a marked recovery in all occupations, which continued and was even accentuated in the course of 1915. But if the numbers employed increased in every industry, the extent of the recovery varied greatly. Unemployment, which we calculated in an earlier chapter by adding the percentage mobilized to the percentage employed and deducting the total from 100, may be said to have ceased by the middle of 1915 in the industries working wholly or mainly to meet military requirements: metals, food, chemicals, transport, and leather. In October 1915 the proportion of unemployed in textiles, clothing, and woodwork was 11 per cent; in printing and binding, 21 per cent; in building, precious metals, pottery and glass-making, over 30 per cent.

The phenomenon of unemployment, which has been discussed in an earlier chapter (pp. 34-42) need not further detain us; moreover, as time passed, workmen transferred themselves from the less active to the more active industries, and the fact that an industry was employing less than its normal staff does not signify that a corresponding number of workers were unemployed. What is of more importance is the proportion of staff employed by the various industries at different periods of the war. These proportions are given in Appendix VIII, and Appendix IX sets forth the industries that were most active, and those that were least active, at the different dates.

The groups that suffered most in August 1914 were: precious metals, in which the personnel employed in the factories inspected

fell to 10 per cent; precious stones, in which it fell to 19 per cent and subsequently in October of the same year to 16 per cent; building, pottery, and glass, where it fell to 20 per cent. During the course of the war the numbers employed in these four groups rose steadily, but they remained among the least active industries; however, from July 1916, printing and binding took the place of the precious metals among the four slackest trades.

The groups that suffered least in 1914 were: the manufacture of food, 49 per cent; miscellaneous industries, 49 per cent; transport and storage, 46 per cent; chemicals, 42 per cent. But war manufactures soon put metallurgy, chemicals, and leather in the first rank. Manufacture of food remained nearly on a level with leather; and transport and storage, a specially prominent industry in the ports, kept a good place throughout. In 1917 wood-working, under the impetus given it by the development of aviation, found its way into the four most active groups, but below metallurgy, chemicals, and transport.

In July 1917, the period of greatest industrial activity, the index-numbers showing the proportion of staff employed in the busiest groups were as follows: metallurgy, 167; chemicals, 120; transport and storage, 97; leather, 85; food, 85; wood, 84. In the least active groups they were: building, 51; precious stones, 52; printing and binding, 55; bricks, pottery, and glass, 56. Until this date employment had been increasing in all groups; from now onward a slight decline occurred in food, chemicals, leather, and metallurgy. Transport and storage, building, wood-working, clothing, and printing and binding, continued to make some progress.

The following are the highest index-numbers reached by each group in the course of the war:

Food,	85, July 1917	Wood,	93, July 1918
Chemicals,	120, July 1917	Metallurgy,	167, July 1917
Paper,	79, January 1918	Precious metals,	68, July 1917
Printing,	60, January 1919	Precious stones,	54, January 1919
Textiles,	82, July 1917	Building,	60, July 1918
Clothing,	87, January 1919	Pottery and glass,	57, January 1918
Leather,	85, July 1917	Transport,	105, January 1919

The lowest index-numbers were, in all industries, those of 1914.

Metallurgy employed more than its normal complement from the

beginning of 1916 to the end of the war; chemicals from July 1916 to the end of the war; transport reached its normal in 1916. After the war, in 1920, metallurgy, building, and transport were employing more than their normal numbers.

As regards all French industries taken together, their index-number of employment at its maximum just reached 100, the pre-war normal, notwithstanding a loss of about 25 per cent of staff owing to mobilization (after allowing for temporary exemptions); that it was able to do this is due to the fact that the war industries (metallurgy and chemicals) not only took over the unemployed of other industries and a considerable number of foreign and colonial workers and prisoners of war, but also recruited a large amount of female labor. The groups that ceded their unemployed to the war industries were printing and binding, fine metals, pottery and glass, and building.

Before we close this chapter, some figures must be given regarding the recovery of industry in 1920, after the period of suspense of 1919. We have already explained that it is impossible to treat the returns of July 1919 and January 1920 on the same footing as those of earlier dates because they relate to the whole French territory and not only to the uninvaded portion. But taken by themselves the figures of the return of January 1920, notwithstanding their restricted statistical basis, furnish interesting information with regard to the industrial situation of the whole of France at that date. They are reproduced in Appendix XI, and show a slow recovery in the early part, a rapid recovery in the last weeks, of 1919. The activity of the chemical group diminishes and the manufacture of explosives, gas, and sulphuric acid ceases; metallurgy remains at the same level of employment; the other groups become increasingly busy, especially textiles, fine metals, transport and storage, and building.

The above general survey requires to be supplemented by a detailed description of French industry during the war (a) by districts, and (b) by industrial groups. A description according to districts will be found in Appendix I; and the several groups of

industries will, as already explained, be dealt with in the monographs constituting Part II. Before proceeding to these, we shall devote a chapter to certain features of French industry during this period other than variations in employment.

CHAPTER IV

GENERAL CHARACTERISTICS OF THE INDUSTRIAL SITUATION, OTHER THAN EMPLOYMENT

HAVING dealt with employment, as an approximate measure of industrial activity, we shall now give certain other very general characteristics of the situation during the war: condition of the workers—wages, cost of living, and strikes; wholesale prices and profits; motive power, raw materials, and markets (imports and exports).

We are far from being able to treat these various questions with the accuracy that we should wish; as regards several of them we can adduce only indirect evidence. Moreover a separate volume is contemplated in respect of the condition of the workers, so that we shall treat this subject briefly; we must, however, give certain essential figures, for wages are an element in cost of production and react on profits and industrial prosperity.

Condition of the Workers.

Strikes. We shall begin this section with a few words on the strike movement, which illustrated, by its spasmodic efforts, the difficulty of adjusting wages to cost of living.

Strikes, which were rare at the outset of the war, became more numerous as labor became scarcer. The question of wages, in consequence of the increased cost of living, gave rise to frequent disputes, and, in spite of the efforts at conciliation made by the Ministers of Labor and Munitions, to strikes of some importance. We shall not dwell on the delicate and continual negotiations with associations of employers and of labor by which the Ministers were able to effect a large number of agreements and arrange wage tariffs, nor on the direct conferences between employers and workmen for the same purpose: these will be dealt with in the special volume on wages. We shall confine ourselves to the table in Appendix XII in which we compare the position of industry, in respect of strikes during the war, with the position in 1912 and 1913.

It will be observed that the number of strikes, which was 654 (involving 159,506 strikers) between January and July 1914, was only 18 (involving 1,060 strikers) from the outbreak of the war to the end of the year, an indication of the spirit of goodwill that animated employers and workers at that time. During 1915 there were only 98 strikes, involving 9,344 strikers.

But the strike movement developed during the ensuing years. Though still unimportant in 1916, it became very considerable in 1917 (696 strikes and 293,810 strikers). This high figure was due to a twofold cause: firstly to the fact that the cost of living constantly increased from the time of mobilization, imperceptibly at first—the index-number rose only from 1,000 in 1914 to 1,170 in 1915; then more rapidly in 1916 when it rose to 1,400, and still more rapidly in 1917, when it reached 1,800. Secondly, the patriotic impulse which at the outset of hostilities had induced labor to accept the harshest terms without protest necessarily wore off with time; moreover the check to the military offensive of the spring of 1917 had a marked effect on the spirit of the civilian population. The total of industrial conflicts remained fairly high in 1918. For the four years 1915-1918 the number of unsuccessful strikes was relatively low, and the number that ended in compromises especially high.

After the Armistice, in 1919, strikes reached the very high total of 2,026 and involved no fewer than 1,160,718 strikers. The transition from war industries to peace industries was inevitably accompanied by friction, and the difficulties in connection with the eight-hour day increased the number of disputes. The great strikes occurred in the mining, chemical, and textile industries, in the manufacture of ordinary metals, in building, and transport. Three-quarters of the strikers were on strike during May and June, and 40 per cent of the days lost by strikes were lost in the department of the Seine.

Wages. The principal difficulty in following the course of wages resides in the fact that they were not made the object of continuous, accurate, and comparable returns. We have data from several sources, which supplement each other but do not harmonize. We have, however, two continuous, homogeneous, and particularly accurate series of wage records, one relating to the mines, and the other

to sugar-factories. We shall begin with the former, which is summarized in Appendix XIII.

The general index-number of miners' wages, it will be seen, rose in 1919 to 249, in 1920 to 369, and fell in 1921. There was a tendency toward an equalization of rates within the great mining areas, but rates rose more in the Loire than in the Pas-de-Calais; and the increase was greater in the wages of surface workers than in those of the skilled miners.

Appendix XIV gives corresponding figures for the sugar-factories; the index-number for men's wages rose to 435, or higher than the 369 recorded in the mines (it rose rather less for the wages of women and children). It is notorious that agricultural wages, especially toward the end of the war, rose more rapidly than industrial wages, simply because they were lower and because the great migrations of workers during the war tended to produce an equality of rates of remuneration, as between professional and manual labor, and between Parisians and provincials. A similar explanation will doubtless account for the difference in the proportional rise of wages in the mines and sugar-factories.

We have statistics of less accuracy, and only at intervals of five years, in the returns of the Trade Councils and of Municipal Councils. In Table 22 are given the index-numbers representing the *estimated* rates of remuneration in 38 male occupations and seven female occupations; masons are shown separately, their index-numbers illustrating the disturbance in the rate of wages of skilled workmen. The average index-number for workers of both sexes in Paris in 1921 was about 370, that for women being higher than that for men, 390 as against 354. For the other towns in France the index-number in 1921 was over 400.

TABLE 22

Date	38 male occupations		7 female occupations		Masons	
	Paris	Other towns	Paris	Other towns	Paris	Other towns
1911	100	100	100	100	100	100
End of 1916	115	121	115	112	113	122
End of 1920 and begin- ning of 1921	354	410	390	412	327	411

The following tables (23 and 24) show the daily wages and corresponding index-numbers (1) in the textile industry in certain districts in 1911 and 1921, and (2) in the printing trade at Lyons in 1914 and 1921.

TABLE 23

	1911	1921	1922 (February)
Roubaix-Toureong			
Cotton-spinners			
Rate frs.	5.50	25.68	22.48
Index	100	467	409
Wool-spinners			
Rate frs.	6.50	26.24	23.04
Index	100	404	355
Troyes			
Weavers			
Rate frs.	4.00	21.20	18.00
Index	100	530	450
Cotton-spinners			
Rate frs.	4.00	23.60	21.20
Index	100	590	530
Vienne			
Wool-spinners			
Rate frs.	3.50	18.24	14.96
Index	100	521	427

TABLE 24

Date	Lyons	
	Printing Industry	
	Rate frs.	Index-number
1914	7.00	100
1921		
January-April	24.85	355
May-July	22.00	314
August-October	21.50	307
November-December	21.00	300
1922		
1st half-year	23.17	331
2nd half-year	23.00	329

The average rate of wages of a *printer in Paris* during the war is represented by the following index-numbers:

Pre-war	100	July 1918	145
January 1916	111	January 1919	166
January 1917	122	July 1919	277
July 1917	133	July 1920	322
January 1918	144	August 1920	355

The index-numbers in Table 25 have been calculated as representing the daily wages of laborers in the engineering trade. Skilled artisans are excluded, as their guaranteed minimum wage does not exactly represent the progression in piece-work rates.

TABLE 25

<i>Dates</i>	<i>Men</i>		<i>Women</i>	
	<i>Paris</i>	<i>Other districts</i>	<i>Paris</i>	<i>Other districts</i>
Pre-war	100	100	100	100
End of 1917	173	166	231	222
1st half 1918	173	189	231	247
2nd half 1918	220	228	252	293
1st half 1919	288	274	326	320
2nd half 1919	288	289	326	293
1st half 1920	326	320	361	393
2nd half 1920	326	341	361	395
1st half 1921	306	300	340	375

All the above data, taken together, give the following figures as representing very roughly the course of wages:

<i>Men</i>	Pre-war	100
	End of 1916	120
	End of 1917	170
	End of 1920	380

But women's wages increased in a greater proportion, particularly in the manufacture of metals, where they were much in demand and received, from the early days of the war, wages higher than the ordinary remuneration of female labor.

Cost of living. Real wages. We do not possess figures of the cost of living, properly so called, during the war; but we have index-numbers calculated for various districts on the retail prices of thir-

teen commodities,¹ of which eleven are food-stuffs. Each commodity is weighted according to the quantities normally consumed. It should be noted that these index-numbers are generally higher than those of the cost of living during the period in question, mainly in consequence of the Rent Restriction laws, which kept rents very low. Thus in Paris, while the index-number for the cost of living (calculated from 1919 onward) was 238 in July 1919 and 341 in July 1920, the index-numbers of the thirteen commodities at these dates were 261 and 373. Appendix XV gives the table of the index-numbers of the thirteen commodities before, during, and after the war. Comparing it with nominal wages, the reader will see that the cost of food rose a little faster than wages during the war, at least so far as men's wages were concerned. The difference is less when the influence of rent is taken into account, and disappears altogether in 1921. A few index-numbers of prices in other countries are given for purposes of comparison.

Appendix XVI shows *real* wages in various industries, the index-numbers indicating their purchasing power in the first half of 1921 as compared with their purchasing power in 1911. The table brings out that the real wages of workers in industry and agriculture were with few exceptions higher at the later date. Real wages, it would seem, says the International Labor Bureau, were, in 1919 also, higher than in 1911; 'but the delay in adjusting remuneration to the increasing price of commodities brought real wages in 1920 below the level of 1911.' The International Labor Bureau adds that 'as in other countries, the increase in real wages was less marked in respect of skilled than of unskilled labor; and workers in Paris received relatively smaller increases of remuneration than those of other towns. The real salaries of employees in Government services, except in the lower ranks, were much below the level of 1911.'

Wholesale Prices and Profits.

Having dealt with wages, we shall now set out the prices of commodities. It will at once be apparent that wholesale prices, notably those of industrial commodities, increased far more than wages. It is true that, particularly after the war, certain raw materials that

¹ Bread, meat, bacon, butter, eggs, milk, cheese, potatoes, haricot beans, sugar, edible oil, paraffin, and methylated spirit.

reach France mainly or wholly from abroad, such as coal, cotton, and wool, had to be purchased at very high rates. Nevertheless there is no doubt that during the war prices were in general remunerative. The index-number of industrial prices reached its maximum in April 1920, at about 600 (prices of July 1914 = 100). See Table 26.

TABLE 26

INDEX-NUMBERS OF WHOLESALE PRICES IN VARIOUS COUNTRIES

	<i>France</i> (<i>General</i> <i>statistics</i>)	<i>England</i> (<i>Economist</i>)	<i>Italy</i> (<i>Prof.</i> <i>Bachi</i>)	<i>United States</i> (<i>Labor Bureau</i>)
Number of products	45	44	44	294 (variable)
July 1914	100	100	100	100
July 1915	143	128	142	101
July 1916	188	164	210	120
July 1917	273	218	331	187
July 1918	344	239	467	198
July 1919	356	251	395	219
July 1920	506	307	658	262
July 1921	337	187	566	148

Appendix XVII gives the actual prices of a certain number of industrial commodities, at various dates between 1914 and the Armistice.

As regards profits, two sources of information are open to us, the income-tax schedule relating to commercial and industrial profits, and the special tax on the war profits of industrial and commercial undertakings. The latter was levied on the excess profits realized from the 1st August 1914 to the 30th June 1919, 'excess profits' being those which exceeded the average of the three years preceding the war, or in the case of newly started businesses, profits exceeding 10 per cent on the capital invested. Undoubtedly neither are all the returns of profits trustworthy, nor are all their estimates correct; but none the less the official figures of excess profits afford some valuable information; they are as follows:

	<i>Francs</i>
1st August 1914-31st December 1915	2,457,555,000
Year 1916	4,214,700,000
Year 1917	5,323,780,000
Year 1918	5,407,910,000
Year 1919	6,685,930,000
1st January 1920-30th June 1920	3,008,145,000

These being the *excess* profits, we will now attempt to arrive at some idea of the *total* profits. The figures below are those accepted for income-tax purposes. It must be remembered that many returns are incorrect; that losses are not deducted from the totals here given; and that excess profits duty paid is deducted from the profits of 1917, 1918, 1919, and 1920.

	<i>Francs</i>
Profits realized in 1917	7,442,051,000
Profits realized in 1918	7,667,377,000
Profits realized in 1919	10,766,760,000
Profits realized in 1920	13,721,532,000
Profits realized in 1921	12,163,280,000

On reference to the prices of industrial securities, one finds that if the average price of the 190 principal securities (paying varying dividends) for the period 1901-1910 is taken as 100, their average price for the year 1921 was 145, the prices of various groups of securities in that year being as follows:

Banks	132	Textiles	208
Coal-mines	160	French railways	57 to 80
Metalliferous mines	157	Gas and water	65
Metals	139	Electricity	124
Engineering	267	Food and hotels	125
Ship-building	225	Printing	144
Building materials	265	Large shops	181
Chemicals	248		

Dividends did not increase in 1920 and 1921 proportionally to the diminished purchasing power of the franc; the average dividend of these securities may be reckoned at 3 per cent in 1913, 7 per cent in 1920, and from 5.2 to 5.5 per cent in 1921. The later dividends, allowing for reduced purchasing power, were worth less than those of 1914.

Motive Power and Machinery.

We gave in our first chapter an analysis of the total motive power (steam and hydraulic) employed in 1906 and of the steam-power employed in 1913, and endeavored to distinguish, so far as the official data permitted, the motive power installed in the invaded territory from that installed in the remainder of France. We shall now observe the development during the war of the use of steam- and water-power.

Steam-engines. Between 1913 and 1919 (leaving aside Alsace-Lorraine) the steam-power employed fell by 5 per cent, and the number of factories utilizing steam-power by 17 per cent, as appears from Table 27.

TABLE 27

	1913	1919	<i>Reduction</i>	
			<i>Number</i>	<i>Per cent</i>
Number of factories utilizing steam-power	63,100	52,300	10,800	17
Number of boilers	103,600	85,800	17,800	17
Number of steam-engines	81,700	66,100	15,000	19
Total power in kilowatts ¹	2,601,000	2,465,000	136,000	5

The cause of this decline is to be found in the devastated regions: whereas the total diminution was about 136,000 kilowatts, it was 273,000 for the department of the Nord alone, and 400,000 for six invaded departments. Power was increased in 41 departments, reduced in 42, and remained stationary in four. When it is considered that between 1906 and 1913 the increase of power had been at the rate of about 120,000 kilowatts a year for the whole of France, one is forced to the conclusion that, notwithstanding its development during the war in certain regions and certain industries, the total employed in 1919 was far less than that which would have resulted from a normal rate of increase. The statistics, it should be remembered, are affected by the fact that a considerable proportion of the war factories, and notably chemical works, had, in 1919, been closed down; annual statistics for the period 1915-1919, which would have enabled us to trace progress during the war, are unfortunately not available.

¹ Obtained by multiplying horse-power by 0.735.

The fact that the total power utilized had fallen by only 5 per cent, while the number of boilers had fallen by 17 per cent, and of steam-engines by 19 per cent, indicates that notwithstanding the events and impediments of the years 1914-1918, manufacturers continued to install in their factories mechanical units of high power.

Appendix XVIII shows the amount of steam-power employed by various branches of French industry in the post-Armistice period as compared with the year preceding the war. The destruction of the great central power-stations, of the mining establishments, and of the textile factories of the Nord and the Pas-de-Calais explains the temporary decline in the electrical, mining, and textile groups. There was moreover a suspension of activity in manufactures as a whole (clothing and textiles, food, furniture, and implements) owing to the uncertain outlook and the transport difficulties in 1919. The chemical industry had closed, in whole or part, the factories producing sulphuric acid, explosives, gas, etc.; on the other hand agriculture had developed its mechanical equipment, and building and public works were in full activity; and the manufacture of metals was profiting by the power-plants that had been set up during the war.

Hydraulic power. The statistics of 1906 and 1922 are not drawn up on the same basis, so that exact comparison is impossible. But, after the necessary corrections are made, it appears that, excluding factories employing less than 200 kilowatts of power, the total hydraulic power in use in 1906 was about 250,000 kilowatts, and, in 1922, 624,000 kilowatts (excluding the Rhine basin). If new installations proceeded from 1906 to 1914 at the same rate as from 1901 to 1906, the power utilized in 1914 must have been about 425,000 kilowatts (excluding plants of less than 200 kilowatts). It follows that the plants of more than 200 kilowatts installed between 1914 and the end of 1921 represented a total of 200,000 kilowatts. The average rate of installation between 1906 and 1922 was 25,000 kilowatts a year, and this rate did not decline during the war, for if installation was suspended in 1914 and 1915, it was resumed very energetically in 1917 owing to the dearth of coal.

At the beginning of 1922 hydraulic power in use, as represented by falls of more than 200 kilowatts, and including the basin of the Rhine, amounted to 630,000 kilowatts. If the smaller falls are added,

the total would certainly be between 1,100,000 and 1,200,000 kilowatts. Plant representing a further 345,000 kilowatts was at that date in course of construction, a rapid rate of progress, due to the impulse of the war; and plans for a further 3,500,000 kilowatts were under consideration, but their realization may be slow.

Difficulties in Connection with Raw Materials and Markets.

The monographs in Part II contain such figures of *output* during the war as we have been able to procure. No general view of it can be given, except through the variations in employment and motive power that we have discussed. But it may be useful to furnish some general figures regarding *raw materials* and *markets*.

French industry cannot subsist without raw materials from abroad, and it cannot procure these cheaply, at a favorable rate of exchange, unless it exports part of its output. In fact, certain industries could not prosper, or even be carried on at all, unless they sold part of their products abroad. The object of the German submarine campaign was, in particular, to arrest, or at least to reduce, foreign trade, so as to bring about a dangerous diminution, a partial paralysis, in French productive activity. We shall see in what measure commerce succeeded in supplying industry, in spite of the closing of many of its usual markets, and of the high rates of freight and exchange. We are not concerned with the methods by which it did this; they will be dealt with in other volumes.

Appendix XIX gives, to begin with, a very summary table of the foreign trade of France, showing imports and exports, in weight and in value, for the years of the war and those preceding and following it. A special column gives the value of the trade with the French colonies, which was carried on actively during hostilities. The table shows that, in weight, French imports remained during the war at their normal level, certain products or materials, notably steel and machine-tools, taking the place of others. Exports on the contrary fell very considerably; not only did France lose important customers such as Germany, Austria, and Russia, but French industries devoted themselves so far as possible to meeting the requirements of national defense. The following figures represent the proportion of imports to exports, in *weight*, for the years 1890 to 1920:

1890	3.36	1914	1.89	1918	7.89
1900	3.29	1915	8.08	1919	6.91
1910	2.11	1916	10.75	1920	3.93
1913	2.00	1917	11.63	1921	2.37

This proportion, which fell continuously from 1890 to 1914, rose from 1915 to 1917. It fell in 1918 owing to difficulties in obtaining supplies of steel and to a great productive effort. It is now tending to its pre-war level, though remaining somewhat above it.

The figures of the values imported and exported are not so easy to interpret, owing to the continuous rise in unit prices; but the *proportion* of the value of imports to the value of exports is not subject to this disturbing factor and has a precise significance from different standpoints, and in particular with regard to the French exchange. The following figures give the proportion in the various years:

1890	1.18	1914	1.31	1918	4.72
1900	1.14	1915	2.80	1919	3.01
1910	1.15	1916	3.32	1920	1.86
1913	1.23	1917	4.58	1921	1.09

The movement in values is analogous to the movement in weights, but the figures are lower; for French exports consist in finished products whose value per unit of weight is often high. It is at once apparent from the above how unfavorably the French commercial balance was affected by the war.

We must complete this brief analysis by indicating the relative importance of various countries to France as furnishing her with raw materials or serving as markets for her products; the war here made considerable changes.

The distribution in 1913 of French foreign and colonial trade, excluding transit, is given in Table 28.

In short, France's principal *purveyors* were Great Britain, Germany, and the United States; then the French colonies as a whole, then Belgium, Russia, and the Argentine. Her principal customers were Great Britain, Belgium; then the French colonies, then Germany, and at a long interval the United States and Switzerland.

Compare with this Table 29, giving the distribution of French colonial and foreign trade (re-exports excluded) for the years 1913 to 1918, in millions of francs.

TABLE 28

Out of a general total of	<i>Imports</i>	<i>Exports</i>
	8,421 millions of francs	6,880 millions of francs
	<i>Per cent</i>	<i>Per cent</i>
French colonies accounted for	9.5	13
Great Britain accounted for	13.3	21.1
United States accounted for	10.6	6.1
Belgium accounted for	6.6	16
China and Japan accounted for	4.3	0.5
Italy accounted for	2.9	4.4
Brazil accounted for	2.1	1.3
Russia accounted for	5.4	1.2
Spain accounted for	3.5	2
Switzerland accounted for	2.8	6
The Netherlands accounted for	1.3	1.2
The Argentine accounted for	4.3	2.9
Rest of Central and South America accounted for	2.3	
Germany accounted for	18	12
Austria accounted for	1.2	0.6
Other countries accounted for	17.6	11.5

TABLE 29

<i>Country</i>	<i>1913</i>		<i>1915</i>		<i>1918</i>	
	<i>Imports</i>	<i>Exports</i>	<i>Imports</i>	<i>Exports</i>	<i>Imports</i>	<i>Exports</i>
Algeria	330	553	547	367	624	604
Morocco	20	79	41	89	149	108
United States	894	423	3,027	446	7,140	419
Great Britain	1,115	1,454	3,038	1,098	6,395	1,082
Russia	458	83	77	113	68	..
Belgium	556	1,108	23	36	5	36
Switzerland	135	406	244	297	432	409
Italy	240	306	433	388	818	780
Spain	281	151	581	139	578	183
Brazil	174	86	210	55	551	92
The Argentine	369	200	473	107	1,073	115
Germany	1,069	867	8	..	5	..
Austria	103	44	4	..	..	..
Turkey	94	83	10	..	2	1
Other countries	2,583	1,037	2,320	802	4,466	894
<i>Totals</i>	8,421	6,880	11,036	3,937	22,306	4,723

The year 1914 has no clear significance: peace prevailed during the first half, war during the second. In 1915 imports from Germany, Austria, Turkey, and Belgium fell to a trifling amount, and those from Russia diminished greatly; imports from Algeria, Morocco, Switzerland, Italy, Spain, Brazil, and the Argentine, increased; those from Great Britain nearly trebled, and those from the United States more than trebled. But if one is looking at the question from the point of view not of finance or exchange but of industrial supply, weight and not value of imports should be considered. In weight, imports from Great Britain increased by 55 per cent, those from the United States by 170 per cent, in 1915 as compared with 1913. In 1917 55 to 60 per cent of French imports, calculated either as to value or weight, came from the United States and Great Britain, but the heavy and less costly goods came principally from the latter. Algeria and Morocco were increasing their contribution; we shall give further on some separate information on the colonial aspect of the matter.

These figures bring into prominence, first, as regards exports, the immediate loss by France of a third of her markets, Belgium, Germany, etc.; and secondly the loss of raw materials from Germany (13 per cent), Belgium (7 per cent), and Russia (5 per cent). They also disclose in general the increasing importance of sea-transport in providing French industry with materials and with markets. In order that the situation may be clear, we will now furnish certain summary information in regard to exchange and freights. We must not forget in this connection the sources of supply of raw material (coal and iron) that France lost as a result of the invasion, nor the capacity of export of the occupied territory.

We have already seen that the change in the proportion of imports to exports indicated an unfavorable situation from the point of view of the exchange. There ensued a fall in the value of the franc in terms of the currencies of the countries with which France traded, except as regards the Italian lira. The English and American exchange on Paris, after having remained about par for six months, rose until April 1916 (to 13 per cent premium London, 16 per cent New York). At that date the Anglo-French agreement stabilized the exchange (at 10 per cent premium London, 12 per

cent New York) until April 1917. The entry of the United States into the war had the effect of lowering the American and British exchange on Paris; the rates then remained steady (slightly under 8 per cent premium London, 10 per cent New York), from May 1917 to August 1918, when a fresh fall brought them nearer par.

The Swiss exchange rose, with fluctuations, until July 1918, when the premium was as high as 48 per cent; it fell again to 12 and 14 per cent at the end of 1918. The Netherlands exchange followed the same course, but only reached a premium of 42 per cent, and remained between 10 and 12 per cent toward the end of 1918. The Swedish premium on Paris was somewhat higher than the Swiss; it reached a maximum of 75 per cent in November 1917 and dropped to 44 per cent in July 1918 and to less than 10 per cent at the end of that year. On the contrary, the Italian lira fell continuously until 1918, when it stood at 40 per cent discount; it then recovered rapidly and stood at a discount of 15 per cent at the end of the year. Until May 1915 the Swedish and Swiss currencies stood at a little below par.

The allied currencies fell continuously at Geneva until July 1918. The enemy currencies fell until December 1917, rose in January 1918, and then continued to fall until the end of 1918, with a slight fluctuation at the moment of the Armistice.

Thus the exchange increased the price in francs of France's foreign purchases to the extent at one time of 50 and even 70 per cent. The situation in this respect was not unfavorable at the Armistice; but when, shortly afterwards, the financial union of the Allies came to an end, the franc began to fall afresh and its depreciation gradually became considerable.

These movements in the exchange, if they enhanced the price of the raw materials purchased by France, at least made it easier, by way of compensation, to find markets for her products. It was otherwise with the rise in *freights*, due to the abundance of cargoes and the dangers that beset navigation from the beginning of the war; this rise became acute in 1917 and 1918, under the influence of the submarine campaign. French mercantile shipping had been notoriously inadequate before the war, so that recourse was necessarily had, in a large measure, to the chartering of allied and neutral

ships. A few examples will reveal the magnitude of the sums that French industry had to pay in order to secure adequate supplies.

The following are the prices of freight for Northern Range wheat to French ports, in July of each year:

	<i>Frs.</i>	<i>Index-number</i>
1914	14.45	100
1915	52.20	361
1916	83.95	581
1917	187.00	1,280
1918	358.30	2,480 or twenty-five times the pre-war freight.

The price fell after the Armistice to 77 francs.

Table 30 gives the average prices of coal freights, England to France.

TABLE 30
(in shillings)

	1914	1915	1916	1917	1918
Cardiff to Channel ports					
1st Jan.	4/-	13/4	20/4	23/-	23/-
1st July	4/3	11/3	23/-	23/-	23/-
Cardiff to Atlantic ports					
1st Jan.	5 frs. 60	17 frs. 80	38 frs. 05	29/-	29/-
1st July	6 frs. 50	14 frs. 38	29/-	29/-	29/-
Tyne to Channel ports					
1st Jan.	4/-	18/6	23/9	26/2	26/2
1st July	4/3	13/8	26/2	26/2	26/2
Tyne to Atlantic ports					
1st Jan.	5/-	21/8	30/9	35/-	35/-
1st July	5/9	18/3	35/-	35/-	35/-

From June 1916 freights were controlled—and heavily increased, so that a ton which paid 5 shillings from the Tyne to French Atlantic ports in January 1914 paid on the 1st January 1918 about 62 shillings if carried on a neutral ship. Allowing for the fall in the exchange, this meant fifteen times the pre-war freight.

As regards the freight from Shanghai to Marseilles and London, the following are the figures for the same period:

	<i>To Marseilles, Messageries Maritimes</i>	<i>To London, British lines</i>
1914 July	35/-	35/-
1914 August	65/-	65/-
1915 May	79/-	79/-
1916 May	140/-	110/-
1917 May	300/-	110/-
1918 January	650/-	150/-

The freight to Marseilles, allowing for the exchange, was multiplied twentyfold. The English, who did not suffer from the same shortage of shipping and who closely controlled freights, had far less to put up with in the matter of increase of rates.

Here, finally, are the figures for the chartering of Japanese ships, the formidable increase in the cost of which was not without consequence for French industry, for they brought a large quantity of copper, tin, and manganese.

	<i>Yen per ton</i>
January 1914	1.65
May 1915	3.50
August 1916	15.00
May 1917	30.00
June 1918	47.00
September 1918	40.00

The increase, allowing for the exchange, was thirtyfold.

Having given these indications of the bearing of exchange and freight on French foreign commerce, we shall now consider in detail how various classes of imports and exports fared during the war.

Appendix XX shows the place occupied in 1913 by different commodities in the list of French imports and exports; and Appendix XXI the weight and value of manufactured articles, food-stuffs, and raw materials, respectively, imported and exported, before and during the war. Selecting the figures that specially relate to industry, we shall discuss the fluctuations that they exhibited under the pressure of various factors, such as increasing scarcity of freight, its enhanced cost, movements in the exchange, loss of the invaded provinces, etc.

It will in the first place be observed that French imports of raw materials increased greatly in value during the war, but decreased

in weight; and that French exports of manufactured goods also increased in value and decreased in weight. Between 1913 and 1917 the proportion of weight imported to weight exported increased nearly sixfold, and of value imported to value exported nearly fourfold. The increase of the former, apart from other influences acting in the same direction, tended to raise freights, for it entailed an insufficiency of return cargoes. The increase of the latter had, as we have seen, an effect on the exchange.

As regards the raw materials of industry, the *differences* between the weights imported and exported, that is to say the net weights placed at the disposal of French industry from foreign sources, were as follows:

1912	17 million tons	1917	24.1 million tons
1913	18.9 million tons	1918	19.9 million tons
1915	23.4 million tons	1919	25.4 million tons
1916	28.2 million tons	1920	32.2 million tons

The net weights increased by 50 per cent between 1913 and 1916; they dropped in 1917 and 1918 owing to difficulties of navigation and the submarine campaign; in 1918 they were at about the pre-war level. It is easy to form from these figures an idea of the impediments that faced all industries other than those connected with the war, for all the priorities of transport were assigned to coal, steel, military supplies, and food-stuffs; and metals and food-stuffs were imported in far larger quantities than in 1913. The figure for 1920 brings out the extraordinary revival of activity in that year. As regards the average value of a given weight of raw material imported, the quintal (220 lbs.) rose from 500 francs before the war to 800 francs in 1917.

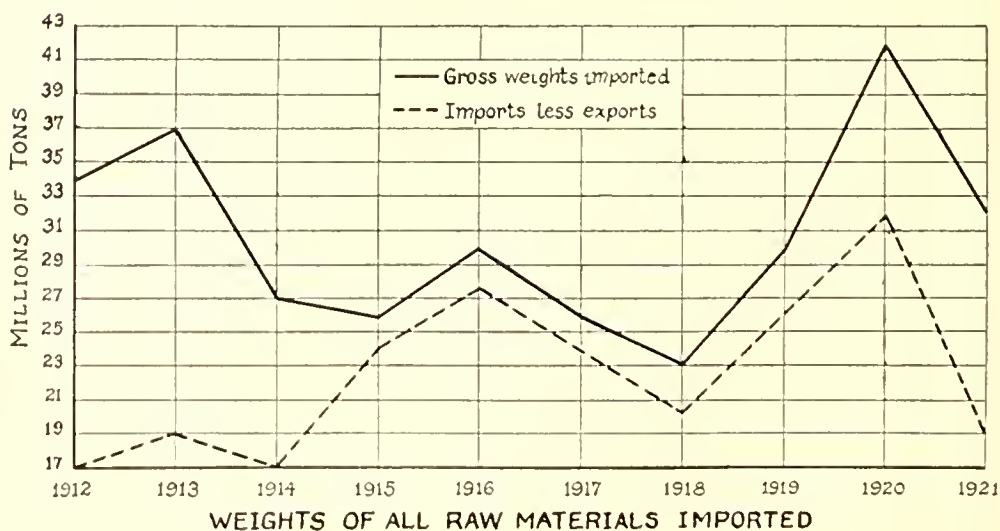
Coming next to manufactured articles, we find that the weights exported by French industry fell in 1915 to one-third of the pre-war figure, and in 1918 to less than one-fifth, while the quantities imported for French consumption increased slightly (by 50 per cent in 1917). The balance between imports and exports (in weight), which had been favorable, became unfavorable in 1915, and the favorable balance was not restored until 1921. The balance in respect of values altered in a similar way, but here the favorable balance was restored in 1920. The average price of the quintal of goods imported rose from 1,230 francs to 4,000 francs in 1917 and

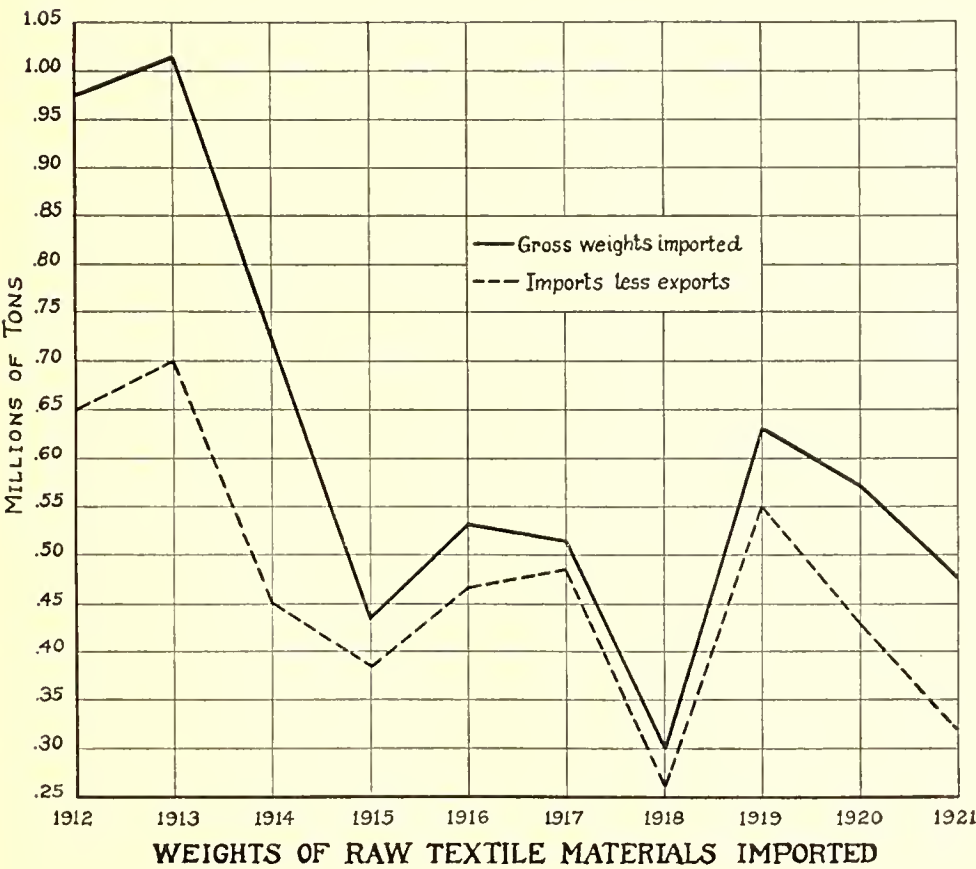
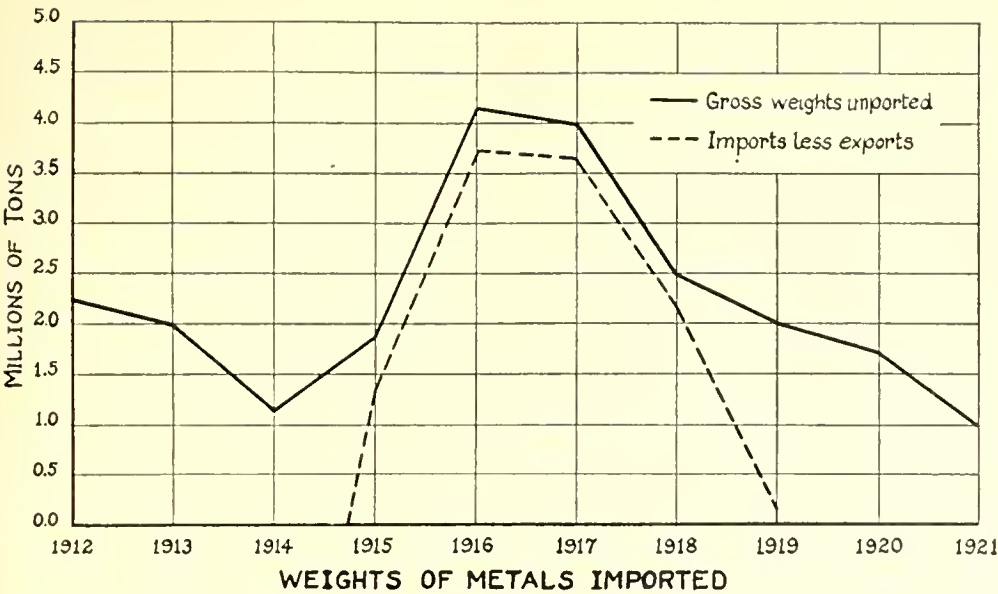
even 5,000 francs in 1920; that of the quintal exported from 1,554 francs to 6,280 francs in 1917, and 9,090 francs in 1920.

Let us return to raw materials, the gross weight of which imported, as we have seen, was from the outbreak of war until 1919 below the normal, and the net weight of which (imports less exports) increased to a certain extent until 1917, then fell in 1918 to the pre-war level. These changes point undoubtedly to industrial embarrassment, particularly if one considers that the increase in net weights related to the raw materials required for munitions, which ceased to be exported and were imported in large quantities. Taking the principal materials utilized for munitions, iron and steel, we find that they alone increased the weight of imports from 200,000 tons in 1913 to 1,100,000 in 1915, 2,900,000 in 1916 and 1917, 1,900,000 in 1918, and 1,000,000 in 1920. Copper, zinc, tin, rubber followed a similar course; the raw materials of other industries, on the other hand, were severely restricted.

The three following diagrams show

1. the gross weights and net weights (imports less exports) of *raw materials of all kinds* imported between 1912 and 1921;
2. the gross and net weights of *metals* imported (aluminium, iron, copper, lead, tin, zinc, nickel, antimony, bismuth and various) during the same period;
3. the gross and net weights imported of the raw materials of textile industries (wool, silk, skins, cotton, flax, hemp, jute, etc.).





The above tables show that while the weight of all raw materials imported diminished during the war, the maximum diminution being 32 per cent of the average imports of 1912-1913, the weight of metals imported increased, to the extent of 60 per cent of the imports of 1912-1913. As a result of this increased import of metals, the drop in the import of other raw materials was greater than the drop in the import of raw materials generally. The weight of raw textile materials imported fell by 62 per cent as compared with 1912-1913, a figure that discloses the extreme shortness of foreign supply from which the textile industries suffered.

Other industrial groups show equally striking reductions of imports. The weight of wood-pulp imported fell from an average of 440,000 tons in 1912-1913 to 280,000 tons in 1915, 160,000 in 1917, 250,000 in 1918, and 270,000 in 1919; so that the paper industry was severely affected. Stones and earths employed in industry dropped from an average of 1,500,000 tons in 1912-1913 to an average of only 300,000 tons in the four following years. Ordinary woods dropped from 1,900,000 tons to 470,000 in 1915, 1,040,000 in 1916, 600,000 in 1917, and 330,000 in 1918.

Coal, the average import of which had been 21 million tons in 1912-1913, fell to 16,700,000 in 1918, a diminution of 23 per cent. If one considers that the output of the French coal-mines was simultaneously reduced by 30 per cent, and that the total coal available for consumption was reduced by more than 30 per cent, while the great coal-consuming industries, such as metallurgy, were actually increasing their consumption, it will be apparent that the industries unconnected with munitions were receiving scarcely one-half of their normal supply of coal.

The detailed effect of these factors on the activity of the various industries will be considered in the second part of this volume, and not only their imports, but their exports and where possible the amount and character of their output will be examined. We may say at once that gross *exports of manufactured articles* have an important significance in relation to *foreign markets*. We have seen (Appendix XXI) that gross exports fell from 2,200,000 tons (220 million quintals) before the war to 750,000 tons in 1915, 650,000 in 1917, 400,000 in 1918, and recovered to 1,850,000 tons in 1920. But our understanding of the situation would be incomplete if we

did not recollect at the same time that before the war French exports of manufactured articles exceeded imports of the same by 800,000 tons; that this balance became unfavorable in 1915 (minus 240,000 tons); that in 1917 imports exceeded exports by more than 1,500,000 tons, and still exceeded them by 600,000 tons in 1920.

Gross exports of all manufactured articles declined in 1918 to the extent of 82 per cent of their pre-war figure, and gross exports of articles manufactured from ordinary metals to the extent of 80 per cent, or in about the same proportion, notwithstanding that the production of these articles increased, because the whole output was reserved for war requirements in France. Clothing exports showed a similar decline; but this was due not only to the needs of the armies, but to the restrictions imposed on the civilian clothing trade. The export of luxury articles diminished by only 70 per cent, but as the diminution was compensated by no demand in connection with the armies or the war, it will be understood that, as the figures of employment indicate, the trade in these articles suffered more severely than the two preceding industries from the reduction of their foreign outlets. The decline of exports in the case of all the above industries was continuous from 1914 to 1918, except for a slight recovery in 1916, due to a marked development in the export of military instruments and weapons, and, to a less degree, of clothing. This development was checked by the submarine campaign.

A summary examination of the *imports of manufactured articles* discloses the following features. After diminishing in 1914 and 1915, they rose considerably in 1916 and 1917 to more than their pre-war level, and fell back to that level in 1918. The rise was especially due to a heavy increase in articles with a military destination, and in clothing, also destined to meet army requirements. The import, on the other hand, of luxury articles fell off during the war by 89 per cent.

Assistance Furnished by French Colonies to French Industry.

The commerce of France with her colonies was not in 1913 of a high order of importance; 9.5 per cent of her total imports (in value) came from them, and 13 per cent of her total exports (in value) went to them. In 1921, after the war, 13 per cent of her imports and 12½ per cent of her exports came from and went to her

colonies. For the two years 1920 and 1921 together, colonial imports represent 9 per cent of the total imports of France, and exports to the colonies 14 per cent of her total exports; so that the relative position held by French colonies in French commerce was approximately the same after the war as before it.

On the other hand the exports of French colonies to France were only 50 per cent of their total exports; and the imports of French colonies from France were only 59 per cent of their total imports. So that it was possible during the war, so far as the conditions of transport permitted and apart from the development of certain categories of colonial produce, to intensify the commerce of France with her colonies, and in particular to obtain from them larger supplies of raw material, by simply giving a preference to the mother country in trade relations.

We are specially concerned to ascertain

1. Whether the relative value of French commerce with her colonies increased during the war, that is to say whether her colonies took an exceptional part in supplying her needs.

2. What particular commodities the colonies supplied to France.

As regards French colonies other than those of Northern Africa, the proportion that the value of France's imports from these bore to the value of all French imports did not increase during the war. This proportion and the absolute value of these colonial imports were:

		<i>Millions of francs</i>
In 1913	0.8 per cent	680
In 1914	0.9 per cent	573
In 1915	0.45 per cent	499
In 1916	0.37 per cent	785

The imports from these distant colonies increased slightly in absolute value, but this increase is, if anything, less than is accounted for by the increase in prices. Moreover the statistics show a reduction in the weight of the principal colonial products imported, except of such as concerned national defense or food supply. The others accumulated at the ports of lading, awaiting facilities of transport.

Nevertheless, the statistics indicate that the difficulties of sea-

transport affected the colonies far less than might have been feared, for whereas they received in 1913 2,350,000 tons of imports, in 1916 they received 2,075,887 or only some 275,000 tons less; and while they exported 4,328,383 tons in 1913, they exported 4,052,342 in 1916, or only 276,000 tons less. In respect of certain colonies the quantities imported and exported even increased.

As regards the countries from which these colonies drew their imports, it appears that in the case of fourteen of them the share supplied by France diminished between 1913 and 1916. As regards their exports, on the other hand, the proportion dispatched to France was developed as much as possible; only four of them (Sénégal, Indo-China, St. Pierre et Miquelon, and the colonies of the Pacific) had in 1916 increased their exports to foreign countries as compared with 1913. And moreover, as regards Sénégal, the increase is only apparent, for in the increase are included large quantities of coal supplied by England for the bunkers of foreign steamers at Dakar. As to the three other colonies, their distance from the mother country and the risks of navigation explain the phenomenon.

The commerce of the North African colonies is summarized in Table 31.

This table shows that French imports from Algeria increased while French exports to Algeria diminished. French imports from Morocco increased very extensively, from 20 millions in 1913 to 114 millions in 1917; and French exports to Morocco, contrary to the general rule that prevailed during the war, remained steady at about 80 million francs. But the proportion that the value of French imports from Algeria and Morocco bore to the total of French imports decreased from 1912 to 1917 as follows: 5 per cent, 4 per cent, 5 per cent, 5 per cent, 3 per cent, 3 per cent.

If we summarily examine the classes of goods imported into France from her colonies, we find that their contribution took principally the form of food-stuffs, and in a less degree of raw materials for industry. As we are concerned here only with the latter, we will mention that the distant colonies supplied to France in 1916 about 100,000 tons of unhusked ground-nuts (80 per cent of their total export of the same), 30,000 tons of husked ground-nuts (99 per cent of their total export), 15,000 tons of palm-kernels (32 per

TABLE 31

SHARE OF ALGERIA AND MOROCCO IN FRENCH
EXPORTS AND IMPORTS

(Values in millions of francs.)

	<i>Total of French imports and exports</i>	<i>Share of Algeria</i>	<i>Share of Morocco</i>
1912			
Imports	8,231	427	19
Exports	6,713	568	52
1913			
Imports	8,421	330	20
Exports	6,880	553	79
1914			
Imports	6,402	313	17
Exports	4,869	445	60
1915			
Imports	11,036	547	41
Exports	3,937	367	89
1916			
Imports	15,159	428	80
Exports	5,102	388	82
1917			
Imports	16,312	372	114
Exports	4,083	313	78

cent), 17,000 tons of palm-oil (86 per cent), 3,500 tons of rubber (78 per cent), 11,000 tons of hides (70 per cent) and 1,650 tons of cotton (23 per cent). Algeria exported to France 8,000 tons of wool, 2,000 tons of hides, 58,000 tons of various ores, 23,000 tons of phosphates, 22,000 tons of chemicals, besides wood, copper, and lead. Tunisia in the same year exported to France 250,000 tons of phosphates, and 30,000 tons of ore, and smaller quantities of chemicals, wool, copper, etc. Morocco exported to France 36,000 tons of ore and 3,700 tons of wool.

CHAPTER V

SUMMARY. CONCLUSIONS

Permanent Changes Due to the War.

(i) *Summary of industrial activity from 1914 to 1921.* We shall now sum up briefly the principal features that have been brought to light by our examination of French industrial activity during the war and the periods immediately preceding and following it, and shall then indicate their more permanent consequences.

We shall not insist further on what we have already said of the initial period of unemployment, followed by a recovery and a shortage of labor, and of the steps adopted to counteract this shortage. We have seen that these steps led to a development of industrial activity in 1917, and to a larger total of employment than in the pre-war period. These high figures of employment were due to the war industries; the others, even if prosperous, were less active than in normal times, and some of them (building and luxury trades) were actually in a critical position.

Industrial activity, whether looked at in the light of its general features, or examined in detail according to districts and industrial groups, is correctly represented by the tables of personnel employed given in Appendices VI and IX. It may be described by its two main characteristics: a general development lasting until the spring of 1917; a growing embarrassment until the Armistice. The embarrassment was specially due: to dearth of coal, of metals, and of certain raw materials, this last occasioned by the manufacture of munitions in the United States; and to the intense submarine campaign, the diversion of shipping to the transport of the American army, the congestion of the railway lines in France, and the German offensive of 1918 in the north of France. The necessity of sustaining the war industries, as a result of which we have a maximum of employment in July 1917 and January 1918, had this consequence, that the scarcity of coal, raw material, and labor weighed all the more heavily on the other industries.

The Armistice inaugurated a period of industrial relaxation, notwithstanding the steps taken officially to facilitate the transition

to peace activities. The Government gave directions for the completion of various war orders of a more or less useful description, and for the manufacture of agricultural implements, building materials, and furniture for the liberated districts; and it placed orders for large quantities of steam-engines and rolling-stock for the railways. But so far as private customers and manufacturers were concerned, the situation was marked by a certain hesitation: no one knew what economic terms the peace treaty would contain, and many believed in a forthcoming fall in prices and awaited developments. Moreover transport facilities were still inadequate.

This stagnation, coupled with demobilization, might have produced a formidable amount of unemployment; but this did not occur. Unemployment increased only to a small extent and for a short period. It is true that men were returning from the colors, but they were released gradually, and refugees and numerous foreign workers were leaving the country; the work in the liberated regions was moreover being organized and the favorable rates of wages offered were attracting labor.

Certain factors operated simultaneously both to increase the hesitation of employers and to reduce immediate unemployment. One of these was the legal eight-hour day, or more correctly the restriction of the effective hours of work toward that limit: a great labor triumph no doubt, conducive to human progress, but calculated for the moment to raise time-work wages and prices. Another was the diminished output of labor, due to war weariness, the diversion of workers to new jobs, and similar causes.

This critical period lasted during part of 1919. In January 1919 the total of employment was about the same as in July 1914, a little below that of January 1914. But there were already signs of recovery, and this became more pronounced as the year advanced (see Appendix VI). In all the industrial groups (except chemicals) the personnel employed in January 1920 was larger than in July 1914 (Appendix IX). As regards districts, Lyons in particular, then Toulouse, Rouen, and Bordeaux, were very prosperous and busier than before the war. Paris and Dijon were at the level of 1914, the others below it (Appendix VI). We omit Lille and Nancy, where there was a recovery, but the principal work was that of reconstruction.

It was only later, when the industrial crisis of 1921 befell, that there arose a considerable amount of unemployment, not comparable in extent, however, with that experienced in England. The heavy losses of man-power during the war, coupled with the demands for labor in connection with the restoration of the liberated districts, deadened the effects of the industrial crisis on employment.

Prices, after the Armistice, continued to rise, in spite of the revival of non-military production. The principal causes of this were: the fall in the exchange value of the franc, the high price of English imported coal, a temporary phase of prosperity, and the eight-hour day. During the second half of 1920 consumption was restricted, prices fell, and a period of difficulty began; for the peace had not restored the world to a position of economic equilibrium. So far as France in particular is concerned, economic equilibrium depends upon a reasonable but effective settlement in respect of the enormous losses inflicted upon her by the war.

(ii) *Brief review of certain economic and social changes.* (a) As regards *labor*, one of the important consequences of the war was the general institution, with various checks and exceptions, of the eight-hour working day (48-hour week) in industry. Part XIII of the *Treaty of Versailles* proclaimed the necessity for this limitation, and the International Labor Conference defined its principles at Washington in 1919. The eight-hour convention had been adopted in the outburst of confidence—and of gratitude to the working classes—that immediately followed the war; but it met with many obstacles in the various parliaments and in practice. None the less France in April 1919 adopted a law on the subject, and everywhere the length of the working day was reduced and tended toward the eight-hour limit.

We may mention also the establishment of official employment agencies in France, an outcome of the shortage of labor during hostilities, and the organization of the immigration of Italians, Poles, Spaniards, Portuguese, etc., recruited to fill the gaps left by the war and to make good the inadequacy of the birth-rate. Lastly, although most of the women who accepted employment during the emergency have resumed their places in the home, war casualties have left for them a more important rôle in industry and in the public services than they played formerly. As to wages, their pur-

chasing power, as we have seen, was about the same in 1921 as before the war.

(b) We may next note, as a consequence of the return of foreign trade to a condition, as regards the tonnage involved, approximating to that of the pre-war period, (1) the temporary difficulty, after the boom of 1920, of finding employment for a mercantile marine sufficiently large, in spite of submarine warfare, to supply munition factories and the army with their requirements; and (2) the fall of freights below cost, and the depression that has characterized the shipping trade since 1921. The mercantile marines of all countries were indeed larger in 1921 than in 1914, and that of France particularly so.

(c) The economic index-number has risen, as compared with the pre-war period, in the United States: that is to say, the purchasing power of gold has fallen. This is a consequence of the natural resistance of the workers to the reduction of nominal wages, which were raised by the war. The corollary is a general rise of prices, without much change in their relative values and without any real improvement in the condition of the working classes, which can benefit only by a greater abundance of the prime necessities of life.

While the purchasing power of gold diminished, the value of the paper franc fell, and there was a very pronounced rise in the French economic index-number; the measure of this rise is the fall in the purchasing power of gold multiplied by the fall in the gold value of the paper franc. The latter is due not only to the cost of the war, but also to the loans which, in the absence of compensating reparation payments, France has had to contract for the purpose of restoring her devastated regions and of making good her losses.

It is usual to say that countries with a depreciated currency have an advantage in respect of external trade over those whose currency is at par. This is true temporarily, while the exchange is falling rapidly, for prices in general do not rise with corresponding rapidity. But it would be a mistake to reckon on a morbid condition of the State finances to develop a country's industrial prosperity. What is true, and what present conditions bear out, is the solidarity of rich and poor nations; both suffer from perturbation of the exchanges.

(d) However this may be, the economic index-number in France

is very high, and this consequence of the war affects her industrial and financial prosperity. When it is taken into account, not only in measuring wages, as has been done above, but also in measuring dividends, it is seen that real profits in 1920-1921 are less than in the pre-war period.

(c) We must here draw attention to the great evolution in France, at least in the large towns, during and after the war, of banking establishments. The reason is to be found in the development, during the war, in point of buildings, plant, and working capital, of the munition factories; and in the post-war loans for the restoration of the devastated districts. It is to be found particularly in the increased prices of raw materials, which are three, four, or five times those of the pre-war period, measured in the actual currency, viz. paper francs. This rise, entailing a considerable increase in the currency value of the working capital required for a given amount of business, has obliged manufacturers to borrow largely; they have had to borrow all the more that a large part of the profits which might have gone to build up this working capital has been taken from them by severe taxation, imposed to meet the imperative needs of the budget, on a scale progressing according to the amount of those profits reckoned in paper francs. Hence it happens that, as the monetary token falls in value, not only the tax, but the proportion of tax levied on the same real volume of transactions, is heavily increased.

(iii) *Industrial development, methods, products.* (a) One of the features of the industrial development occasioned by the war was a closer application to industry of scientific methods and scientific discoveries. It goes without saying that France possessed before the war, besides purely scientific research laboratories, industrial laboratories both official and private. The vigorous industrial movement by which her factories, after the victory of the Marne, renewed and built up her armaments, could attain success only by the most complete adoption of scientific methods. Many laboratories were accordingly established, some on a very large scale.

Great extension was given during the war to the production of automatic machinery for testing pieces after completion or in course of production, so as to permit the employment of only partially

skilled labor. For instance a whole series of machines was devised for testing the hardness of steel; and in connection with the tempering of different metals, the use of optical and electrical pyrometers was generalized, which allowed a single female worker to watch eight or ten furnaces and signal the changes necessary.

The war also occasioned a progress in the scientific organization of factories by the adoption of the Taylor system. At the Penhoët works, where 3,000 workmen were employed, a reorganization on this American method led to an economy in 1917 of 215,380 working hours. The application of this system to the sorting of explosives at the Ripault explosives-factory, where an economy of labor was desired, produced striking results. The hourly output, which from July to November 1916 had been 15 kilos per workwoman, rose to 48 kilos in 1918, and the cost of labor per ton of powder fell considerably.

Standardization also greatly improved manufacturing methods. The demand for mass production, for subdivision of processes, for interchangeability, for facility of repair, etc., established the need for identity of materials, of tools, of patterns, and for standardization. Ministers of Munitions in the allied countries pressed forward inquiries that had long been proceeding in this direction. Standardization was particularly developed in connection with military aviation.

Industrial associations, and especially the syndicates of employers, likewise endeavored to secure co-operation and to simplify manufacture. The principal work undertaken was that of the Railway Commission (in connection with trucks, brakes, electric lighting, etc.); that of the syndical chambers of bolt and screw-makers (bolts, nuts, screws, etc.); of the 'Bureau Véritas' (boats); of the syndical chamber of motor manufacturers, etc. To follow up these investigations, a Permanent Commission on Standardization was set up by the decree of 10th June 1918, and it may be said that this line of development was, from the point of view of mechanical industry, one of the most fruitful adopted during the war.

(b) But the most characteristic feature of recent industrial progress was the remodeling of the plant in numerous factories. War conditions had made it necessary to economize labor and fuel, and at the same time to organize mass production so as to obtain an

immediate increase of the output of certain articles. Accordingly, in most branches of industry, new plant had to be set up or old plant remodeled, in order to save fuel, to make the work easier for a type of labor deficient both in skill and strength, or to adapt the factories to the production of munitions.

Not only were vast works opened to manufacture enormous quantities of shells, but great efforts were made to develop the output of machine-tools. Methods had also to be devised of producing goods that had formerly been imported, such as American fuses, magnetos, Diesel motors, and so forth, previously supplied by Germany. The following is a typical example. We find it stated in the monographs of Part II that kneading-machines were developed during the war. Here are the results of an investigation by the Labor Inspectors carried out in 1923:

Number of bakeries inspected	3,559
Of these, the number that had kneading-machines installed in 1914 was	1,948 or 54 per cent
The number that installed kneading-machines during the war was	509 or 14 per cent
The number that installed them between the end of 1918 and 1923 was	704 or 20 per cent
The proportion that had no kneading-machines was	12 per cent

If we excluded the liberated regions and those near the front, where no installations took place during the war and where the introduction of mechanical apparatus was more advanced before the war the figures would be even more striking. The backward districts are found to have caught up the more advanced. Here, as in other respects, the war tended to level up industrial and working conditions in different parts of the country.

It was especially from 1917 onward that great ingenuity had to be shown in order to keep some of the factories running, for owing to the system of priorities devised to meet the scarcity of transport, private industry found it increasingly difficult to obtain its supplies. The devices resorted to in order to replace coal were particularly interesting: the adoption of substitute fuels, such as wood, sawdust, peat, etc., led to no permanent results; but progress was made in the methods of using coal, in the management of steam generators, and in the development of hydro-electric machinery. Ever

greater attention was paid to the removal from the fuel, by previous distillation, of those volatile products which used to pass away in the smoke and from which tar and various substances can be obtained; manufacturers took steps to consume coal-dust, and inferior qualities of coal capable of yielding power at a low cost. The improvement of furnaces and generators was such that a great electric power-station, which before the war consumed 1,200 to 1,300 grammes (about 42 oz.) of coal per kilowatt-hour, runs today on a consumption of only 650 grammes (about 22 oz.).

In the Pyrenees, the Alps, and the central mountain range, wherever considerable water-power was available, hydro-electric installations were undertaken, many of which were completed only after the war. An additional stimulus was supplied by the submarine war, which reduced the imports of nitrates and made it necessary to consider the question of obtaining nitrates from the air by electric current.

We have already given figures illustrating the progress made in installing hydro-electric plant, and the great amount of work still in course of execution. It may however be thought that, even without the war, this progress would have occurred, though perhaps at a somewhat slower rate.

Improvements in mechanical equipment were promoted by changes in the character of the output, requiring new machinery, and rendered easy by the establishment of new and powerful metallurgical factories. The Minister of Munitions encouraged the erection of new machinery by allowing a high rate of amortization to be included in the cost of manufacture. It should also be mentioned that the factories in the devastated regions have necessarily been equipped with new and more modern machinery, of greater efficiency than the old.

There has also been important progress in chemical industries, for instance in the production of synthetic nitric acid, of sulphuric acid, of dyes, of aspirin, of photographic chemicals, of artificial silk, etc.

So it has been with the electric industries: electrical control of machinery has been increasingly adopted; and the manufacture of all kinds of electrical motors and engines has developed. Wireless telegraphy and telephony, which have today been industrialized and

popularized, supply another typical line of progress. As regards pottery and glass-making, we may mention the great advance in the production of fireproof wares and of window-glass.

We are giving only general examples, of which some of the most remarkable are furnished by the transport industry and by the immense progress of aviation, both during and since the war. The lines of air transport (for mails and passengers) are gradually increasing in number, and are already rendering important services. Everyone knows that the adoption of mass production in the manufacture of motor cars has allowed the introduction today on a large scale of motor haulage, which did not exist before the war. We may mention, in a different sphere, the increase of production and the popularization of cinema films.

Even through the medium of the eight-hour day, we find that the war has indirectly affected mechanical equipment. The mechanical factor has had to be developed to compensate the reduction of output of the human factor. Instances of this are to be seen in the increased use of mechanical cutters for cutting coal in coal-mines, and of machinery for moving, loading, and unloading goods.

These examples, free of technical details, are characteristic features in a general survey. They may be supported by the following brief summary, drawn from the monographs in Part II; the various types of apparatus and process mentioned under each industrial group are among those developed as a result of the war.

Mines. Mechanical coal-cutters.

Food. Kneading-machines; refrigerating plant (rare in France before the war); refrigerating and insulated railway-vans; drying of fruits and vegetables.

Chemicals. Manufacture of aspirin, antipyrin, photographic and pharmaceutical materials, sulphuric acid, synthetic nitric acid, granulated cyanamide, nitrates (from the air), dyes, pencils, artificial silks.

Leather and skins. Chrome tanning, mechanical equipment of tanneries; bootmaking machinery.

Textiles. Machinery for combing threads in cotton industry; replacing of specialist workers by sizing hands (one of whom can attend to four frames).

Woodwork. Sawing-machinery; manufacture of furniture and toys; machinery in cork-factories.

Metallurgy. Manufacture of steel and brass; electro-metallurgy; steel foundry, manufacture of duralumin; motor manufacture; apparatus to relieve manual labor, cranes, transporters; electrical transmission.

Precious metals. Replacement of manual labor by machinery; manufacture of alarm-clocks, counting machines, field-glasses.

Pottery, glass-making. Use of mechanical apparatus in the manufacture of lime and cement; manufacture of fireproof ware, stone-ware pipes and carboys, graphite crucibles, and special porcelains.

Handling and transport. Motor haulage; bridge and canal equipment; electrical transmission; aviation.

Commerce, etc. Banking; cinemas.

We add a few examples of manufactures which, during the war, thanks to the absence of German and Austrian competition, were undertaken or developed in France, or which even temporarily supplanted similar productions:

Food. Diet breads; medicinal plants; jams, syrups and fruits, tomato purée (previously all imported from the Rhine provinces).

Chemistry. Numerous products, e.g. dyes; perfumery, antimony pentasulphide, magnesium, pharmaceutic and photographic materials.

Rubber, paper, etc. Pipe mouthpieces in ebonite; stationery.

Textiles. Stays, hosiery, linen embroidery, tulles and lace (Bar-men type), felts, woven gloves; velvet for upholstery, dolls.

Leather and skins. Thin leathers, leathers for hats; high-class foot-wear.

Wood. Wood-pulp; wooden toys, brushes, pianos.

Metallurgy. Pure zinc.¹ Various machine-tools, self-acting and other special needles, sewing-machines; ironmongery, small mechanical implements, press-buttons, lamp-burners; seamless tubing; surgical and physical instruments.

¹ We should also mention the invention and manufacture of various alloys, such as certain nickel-chromium alloys, offering a great resistance to high temperatures; and the manufacture of bronze in leaves and in powder, of which the consumption amounted to many thousands of tons a year. Before the war such bronze came exclusively from Germany.

Precious metals. Jewelry, imitation pearls, gold-leaf, clock-work.

Pottery and glass. Industrial porcelain; dolls' heads; chemical and pharmaceutical glass; optical and scientific glass; silica bricks, articles for illumination, siphons, clinical thermometers, aneroids.

We should be going outside our subject if we traced the industrial consequences of the territorial adjustments resulting from the treaty of peace. We must however refer to the important increase of industrial wealth attributable to the restitution of the provinces taken from France in 1871. We may briefly mention the iron-ore, coal-mines, and metallurgical industry of Lorraine, which are profoundly modifying the metallurgical policy of France, so as to secure outlets for her superabundant production; also the potash deposits and textile industries of Alsace, to name only the most notable among the new factors affecting the industrial situation.

The spirit of co-operation and economic harmony found its expression in the establishment of industrial fairs. The various International Exhibitions formerly held in France had yielded only indifferent results, while the half-yearly Leipzig fair, in the hands of the Germans, had proved an excellent instrument of publicity and propaganda. An attempt was made during the war to rival the latter. The Lyons Fair, first held in 1916, and every year since, proved an unmistakable success. The Paris Chamber of Commerce, with equally good results, held a fair in 1917 within 100 kilometers of the army front; and the city of Bordeaux likewise held its fair.

We have endeavored to ascertain the extent to which hopes formed during the war in respect to certain commodities have been realized, and how far the attempts to foster their export have been successful. Appendix XXII contains a table giving the exports and imports of various commodities, the manufacture of which in France was expected to develop greatly. If the differences between quantities exported and imported are taken, it will be seen that the results are satisfactory as regards sulphuric acid, aspirin, iron and steel implements, household utensils, chronometers, scientific glass, porcelain for electrical purposes, fireproof ware, ornamental cardboard, imitation jewelry, synthetic perfumes, photographic paper, cinema films, textile gloves, etc. France has freed her interior mar-

kets from foreign competition in respect of certain important commodities, and hopes to do so in respect of others, such as dye-stuffs.

But all countries, and particularly European countries, have since the war been through a period of intense industrial and commercial crisis, which is not yet at an end; as a consequence, all prophecies are vain and observations misleading.

PART II

MONOGRAPHS RELATING TO THE SEVERAL
INDUSTRIES

CHAPTER VI

MINES AND QUARRIES

For a study of the principal extractive industries, concerned respectively with coal and metals, the reader is referred to two works in the present series dealing with mineral combustibles and with metallurgy. We must none the less indicate, in a short summary, the course followed by those industries during the war.

The total quantity of coal¹ extracted in 1913, including the coal consumed by the mines, was 40,844,000 tons.² The output during the first half of 1914 was approximately the same as that of the corresponding period of 1913, amounting to 20,088,000 tons. Of this quantity two-thirds came from the coal-fields of the Nord and the Pas-de-Calais. Miners had numbered 203,208 in 1913, and 205,486 in the first half of 1914.

Imports (coal, *plus* coke and compressed fuel represented by the corresponding weight of coal), which had reached 25,300,000 tons in 1913, amounted to 12,710,940 tons during the first half of 1914, drawn principally from England. Exports in 1913 were 1,386,000 tons, and in the first half of 1914, 641,141 tons. The excess of imports over exports was thus 23,914,000 tons in 1913, and 12,069,799 tons in the first six months of 1914. If the output of French mines be added, without taking into account the variation in stocks, an unimportant factor, we arrive at the consumption of coal in France, 64,758,000 tons in 1913 and 32,157,000 tons in the first six months of 1914.

But the war, by depriving France, from the outset, of the Valenciennes coal-field and of a great part of that of the Pas-de-Calais, profoundly altered the figures of output. Mobilization on the other hand everywhere withdrew miners from their work, and these had subsequently to be provisionally exempted from military service and sent back to the mines. The figures in Table 32 show output, import, and export, and consumption.

¹ Including anthracite and lignite.

² Where statistics are given in tons, metric tons of 1,000 kilos or 2,205 lbs. are intended.

TABLE 32

COAL, ANTHRACITE, LIGNITE, COKE, AND
COMPRESSED FUEL*Thousands of Tons*

	<i>Production</i>	<i>Import</i>	<i>Export</i>	<i>Consumption</i>
1912	41,145	20,704	1,952	59,897
1913	40,844	25,300	1,386	64,758
1914—First half	20,088	12,710	641	32,157
Second half	7,440	5,346	195	12,591
<i>Total</i>	27,528	28,056	836	44,748
1915	19,530	19,734	114	39,150
1916	21,310	20,421	117	41,614
1917	28,900	17,453	125	46,228
1918	26,259	16,855	1,851	41,243
1919	(b) 22,400	(b) 23,300	(b) 200	(b) 45,500
	(a) 19,900	(a) 22,100	(a) 522	(a) 44,000
1920	25,260	35,024	347	59,931

Note: The figures marked (a) in 1919 do not include the coal of the Moselle. Those marked (b) and the figures for 1920 include the Moselle.

During the war, France obtained no coal from the department of the Nord and less than half the normal output from the Pas-de-Calais. All the other coal-fields, during that period, gave more than the normal output. In 1919 the output of all the coal-fields fell below the normal. The Nord began to show a marked recovery in 1920.

The figures in Table 33 show the total personnel employed (underground and at the surface) in all mines (coal-mines, metalliferous mines, and others).

TABLE 33

	<i>1914</i>						
	<i>First</i>	<i>Second</i>					
	<i>half</i>	<i>half</i>	<i>1915</i>	<i>1916</i>	<i>1917</i>	<i>1918</i>	<i>1920</i>
Coal-							
mines	205,486	92,086	105,672	116,983	167,414	168,528	207,107
Iron-							
mines	25,046	4,396	4,077	5,408	7,420	6,679	21,291
Other							
mines	6,750	2,876	3,681	4,531	5,979	5,749	13,734
<i>Total</i>	237,282	99,358	113,430	126,922	180,813	180,956	242,132

In 1913 the total number of miners had been 237,864. For the period of the war, the above totals include both non-mobilized miners and those provisionally exempted, workers under 18, women, and prisoners of war. The number of miners provisionally exempted from military service rose from 33,027 in the second half of 1914 to 108,000 in 1917, falling to 92,629 in 1918. The number of prisoners of war employed in mines rose from 20 in 1914 to 15,427 in 1918. Women and young persons employed in mines, who had numbered about 40,000 in the first half of 1914, rose from 16,134 in the second half of 1914 to 24,224 in 1918. In 1920 they numbered 35,186. In 1920 the number of workers employed in French mines showed an increase of 4,000 over the figure of 1913, and of 42,000 over that of 1919.

In *coal-mines* the proportion of underground workers to the total was 64 per cent in 1920 as against 72 per cent in 1913: 207,107 workers of all categories were employed in them in 1920, but of these the Moselle accounts for 20,400. The figure relating to the pre-war territory is therefore 186,700, showing a reduction of 16,500 or 8 per cent as compared with 1913; and an increase of 33,900 or 20 per cent as compared with 1919. In this increase the Nord and Pas-de-Calais figure to the extent of about 25,000, part of whom were employed on repairs, both underground and at the surface.

The total number of days worked in coal-mines in 1920 was 53,240,000, of which 33,020,000 were worked underground and 20,220,000 at the surface. The total wages paid were 1,016,900,000 francs, of which 688,300,000 francs were for underground work, and 328,600,000 francs for surface work. These figures give an average daily wage for underground work of 20 frs. 84 and of 16 frs. 25 for surface work. If we eliminate the department of the Moselle, these averages become 20 frs. 67 and 16 frs. 33. In 1913 the averages were 5 frs. 96 and 4 frs. 02, respectively; the rates had thus increased by 247 per cent and 306 per cent, respectively.

Table 34 shows the average net output in kilos (2.2 lb.) of coal per day of work, in 1913, 1919, and 1920, and the labor cost per ton of coal produced.

TABLE 34

<i>Department</i>	<i>Average net output per day worked by underground workers</i>			<i>by underground and surface workers</i>		
	<i>1913</i> <i>kilos</i>	<i>1919</i> <i>kilos</i>	<i>1920</i> <i>kilos</i>	<i>1913</i> <i>kilos</i>	<i>1919</i> <i>kilos</i>	<i>1920</i> <i>kilos</i>
Bouches-du-Rhône	1,356	1,179	1,121	919	726	699
Saône-et-Loire	1,368	1,052	1,099	827	620	649
Moselle	1,045	872	857	775	590	585
Loire	952	796	765	612	501	487
Nord and Pas-de-Calais }	975	808	738	730	514	447
Gard	910	699	696	636	426	402
Whole of France	978	803	765	695	506	475

<i>Department</i>	<i>Labor cost per ton produced</i>		
	<i>1913</i> <i>francs</i>	<i>1919</i> <i>francs</i>	<i>1920</i> <i>francs</i>
Bouches-du-Rhône	5.00	18.58	25.77
Saône-et-Loire	6.53	21.07	28.74
Moselle	7.49	25.12	34.23
Loire	8.16	29.76	40.95
Nord and Pas-de-Calais	7.80	30.03	43.90
Gard	7.89	33.37	43.47
Whole of France	7.77	28.68	40.25

As compared with 1913, the reduction of average output in 1920 is 21.8 per cent for underground workers, and 31.7 per cent for workers of all categories taken together.

As regards the production of coke, the following figures give the number of coke-ovens at work and the quantities of metallurgical coke produced, before, during, and after the war.

In 1913 the number of coke-ovens at work was 2,720; during the first half of 1914, it rose to 3,935, but in the second half of that year, fell to 1,114. In 1915 there were only 1,087 at work, but recovery had set in already with 1,508 in 1916; 1,638 in 1917; 1,822 in 1918; 1,851 in 1919, and 1,848 in 1920. In 1913 the French production was 4,027,000 tons. Compare this with the following statement of war-time production and consumption, which is self-explanatory.

Taking those of the above figures which give the output of coke during the years of war, adding imports and deducting exports, we obtain Table 35, which shows the consumption of metallurgical coke.

TABLE 35

	1914		1915
	<i>First half tons</i>	<i>Second half tons</i>	<i>tons</i>
French production	1,985,630	289,444	833,808
Imports	1,408,550	49,981	224,917
<i>Total</i>	3,394,180	339,425	1,058,725
Exports	66,339	39,099	28,715
Consumption	3,327,841	300,326	1,030,010
	<i>1916 tons</i>	<i>1917 tons</i>	<i>1918 tons</i>
French production	1,411,701	1,534,036	1,873,969
Imports	790,992	670,895	516,765
<i>Total</i>	2,202,693	2,204,931	2,390,734
Exports	12,164	19,516	35,836
Consumption	2,190,529	2,185,415	2,354,898

The output of *peat* during the years of the war was as follows; a great effort to increase it was made in 1917 and 1918:

1913	45,000 tons	1917	52,000 tons
1914	37,000 tons	1918	129,000 tons
1915	20,000 tons	1920	78,000 tons
1916	31,000 tons		

As regards iron-mines, the personnel engaged in which has already been given, it will suffice to give a table showing, for 1913 and the war years, production, foreign trade, and consumption (see Table 36). It will be borne in mind that the figure of output for the year 1920 comprises the Moselle region, which had then been restored to France. The considerable reduction of output during the war was due to the loss of the iron-mines of Briey.

TABLE 36
IRON-ORE (THOUSANDS OF TONS)

	1913	1914		1915	1916	1917	1918	1920
		First half	Second half					
Production	21,918	10,882	370	620	1,681	2,035	1,672	13,922
Imports	1,410	611	90	271	627	507	118	405
Exports	10,066	4,620	209	95	75	127	68	4,840
Consumption	13,262	6,872	252	796	1,152	2,415	1,722	9,487

The yield of French metalliferous mines other than iron-mines during the period in question is shown in Appendix XXIII; Appendix XXIV gives the quantities of natural asphalt and bituminous schist extracted and the output, in the form of mineral oil and asphaltic products ('mastic,' etc.), of the factories treating the above, together with the quantities of mineral oil imported. The French production of mineral oil, as will be seen, is insignificant in comparison with the amount consumed, and attention was given, during the war, solely to its import.

The output of rock-salt and the yield of salt springs and lakes, and of salt-pans producing sea-salt were as shown in Table 37.

TABLE 37

<i>Output from rock-salt and salt springs</i>	1914 tons	1915 tons	1916 tons	1917 tons	1918 tons
Unrefined salt	58,622 ¹ 9,701 ²	11,739	32,816	64,050	121,780
Refined salt	154,939 ¹ 75,470 ²	172,298	207,330	212,806	189,865
Salt for soda-water	244,472 ¹ 50,945 ²	357,103	433,524	444,152	303,345
<i>Totals</i>	459,033 ¹ 136,116 ²	541,140	673,670	721,008	614,990
Output from salt-pans	6,846 ¹ 248,442 ²	258,762	447,772	216,585	477,591
<i>Total production</i>	464,879 ¹ 384,558 ²	799,902	1,121,442	937,593	1,092,581

¹ First half of 1914.

² Second half of 1914.

Quarries. The course of events during the war did not permit of the collection of statistics relative to the output of quarries. Table 38, however, allows a comparison to be made of the production before the war, in 1913, and after it, in 1919, and 1920.

TABLE 38

<i>Materials produced</i>	<i>1913</i> <i>tons</i>	<i>1919</i> <i>tons</i>	<i>1920</i> <i>tons</i>
Constructional materials	31,098,000	16,655,000	28,175,000
Industrial materials	4,953,000	3,536,000	4,261,000
Agricultural materials	2,420,000	570,000	942,000
Paving and road-making materials	16,689,000	8,566,000	11,077,000
Ornamental and miscellaneous materials	339,000	393,000	290,000
<i>Totals</i>	55,499,000	29,720,000	44,745,000

We shall complete this summary with a few figures illustrating the condition in which the coal-mines destroyed during the invasion were found after the Armistice, and showing the work of reconstruction involved. The portion of the coal-field invaded by the Germans included the whole of the mines in the department of the Nord, and a large part of those in the Pas-de-Calais.

Surface destruction. In the invaded territory, 103 collieries, comprising 212 pits, had been destroyed, some in the course of military operations, others in the execution of a systematic plan. Moreover a number of collieries outside the invaded zone had suffered in a greater or less degree from bombardments. All the head-gears save four had been thrown down; wash-houses, engine-houses, and more than 16,000 workmen's dwellings had been completely demolished. Nearly all the machinery, representing a total power of 204,000 kilowatts, had been smashed up or put out of action. Eight hundred kilometers of mining railway had been rendered unserviceable and 103 important engineering structures had been destroyed.

Destruction underground. Of the above-mentioned 212 pits, 140 had been mined. In the Nord, only five pits had been blown up, and it had, in general, been possible to block the leaks. But in the Pas-

de-Calais the damage was far more considerable: the breaches as a rule extended to 35 square meters of surface, and some of the pits showed at their summit craters 30 meters across. The majority of the works were thus completely inundated and the quantity of water to be pumped out might be estimated at 110 million cubic meters. More than 3,000 kilometers of underground railway were destroyed or damaged.

The output of 102 collieries, comprising 210 pits, had in 1913 been 20,352,000 tons. In 1920 the output of such of these as had resumed work was 2,433,000 tons, or 13 per cent.

CHAPTER VII

FOOD INDUSTRIES

LET us, to begin with, remind the reader that we are not here concerned with crops and agriculture, but with the *manufacture* of food and drink. As regards these, it should be observed that, although in time of war the civilian population may restrict its requirements, the army must be liberally provided. Accordingly, notwithstanding the mobilization and down to the middle of 1917, factories concerned with the production of food maintained or even exceeded their normal activity. During this period certain branches of food production were hampered in the same way as other industries, but never to so great a degree, nor for long.

From the middle of 1917, however, the submarine campaign and the necessity of restricting imports to the utmost involved various forms of control, and the food industries found themselves embarrassed by numerous difficulties, which endured until the Armistice. Our review will deal successively with the two periods.

Before undertaking the detailed examination of the vicissitudes of the several sub-groups of the food industry, we will draw attention to the following brief table (No. 39). It indicates (a) the average number of establishments at work, and (b) the average per-

TABLE 39

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	73	49
Oct., 1914	79	61
Jan., 1915	81	69
July, 1915	84	75
Jan., 1916	86	79
July, 1916	90	83
Jan., 1917	89	81
July, 1917	92	85
Jan., 1918	90	76
July, 1918	91	67
Jan., 1919	88	67

sonnel employed, in the food industry, at the dates of the several inquiries by Labor Inspectors, in the form of percentages of the establishments at work and of the personnel employed in July 1914.

The inquiry of January 1920, which related to the *whole* of France (comprising the invaded portion excluded from the above figures) gave as the index-number of establishments at work, 96; and of personnel employed, 78.

The number of establishments at work reached a nearly normal figure, 90 per cent, at an early period of the war, and this figure was maintained with little change until the Armistice. As regards personnel employed, after dropping at the outset of hostilities to one-half the normal number, it reached 80 per cent on the average during 1916 and 1917, and then fell again to 76 per cent and even 67 per cent during 1918, at the moment when controls were enforced with the greatest rigor.

Appendix XXV contains a statement of the imports and exports,¹ before, during, and after the war, of some of the most characteristic and indispensable articles of food and drink. The figures illustrate the fluctuations in the activity of certain of the food industries.

Before considering how the important *sugar industry* fared during the war, a brief description may be given of the conditions prevailing in it before the war. From the time of the application of the Brussels Convention of 1903, until the war brought a check, the world production of cane-sugar and beet-sugar had constantly increased. It had attained in

1911-1912	15,887,000 tons
1912-1913	18,208,000 tons
1913-1914	18,667,000 tons
1914-1915	18,531,000 tons
1915-1916	16,541,000 tons
1916-1917	16,680,000 tons

The growth of output arose principally from the increasing cultivation of sugar-cane, and as regards beet-sugar from the larger production of the United States, Germany, and Austria. The French industry was in a stationary condition; after having produced 794,730 tons of raw sugar in 1903-1904, it gave only 786,000 tons in 1913-1914.

¹ Transit trade excluded.

Moreover the proportion of sugar extracted industrially was far lower in France than in Germany, Czecho-Slovakia, and other countries. The following figures sum up the French position in 1913-1914:

Output of sugar	786,000 tons
Area cultivated in sugar-beet	534,000 acres
Yield of sugar-beet per acre	11 tons
Percentage of sugar extracted industrially	12.94 per cent
Yield of sugar per acre	3,238 lbs.

The yield of sugar per acre was in Germany 4,550 lbs., in Italy 5,310 lbs., in Sweden 4,234 lbs., in Denmark 4,170 lbs., in the Netherlands 3,708 lbs., in Austria 3,490 lbs.

There were in France, in 1913, 206 sugar-factories at work, of which the majority were located in the invaded departments. Exports since 1903 had constantly exceeded imports, but had diminished in a marked degree.

During the war the sugar industry, concentrated as it was in the northern and north-eastern region of France, suffered very severely. During hostilities only 64 or 65 sugar-factories remained at work out of 206, and the annual output barely reached 200,000 tons of sugar, two-sevenths that is to say of the French pre-war consumption (700,000 tons in 1913). Toward the end of the war, the restricted supply made it necessary to have recourse to artificial sweetening substances, devoid of the nutritive properties of sugar.

Table 40 indicates how the industry fared during the war.

TABLE 40

	<i>Factories at work No.</i>	<i>Quantity of sugar-beet treated tons</i>	<i>Output of re- fined sugar tons</i>	<i>Proportion of sugar to beet per cent</i>	<i>Total number of days worked by men, women, and children</i>
1912-1913	213	6,674,022	877,656	13.30	3,094,000
1913-1914	206	6,500,000	786,000	12.10	....
1914-1915	69	2,621,462	302,960	11.50	1,410,000
1915-1916	64	1,146,207	135,899	11.80	761,000
1916-1917	65	1,595,868	185,435	11.70	1,050,000
1917-1918	61	1,596,321	200,265	12.50	974,000
1918-1919	51	953,989	110,110	11.50	613,000
1919-1920	60	1,202,418	155,102	12.80	741,000
1920-1921	72	2,303,330	305,042	13.20	....

As regards *alcohol* (brandies, alcohols, liqueurs), whose rôle in the chemical industry will be dealt with subsequently, the quantities imported had, from 1890 to 1913, always been far less than those exported. In 1913, against 184,080 hectoliters¹ imported, 326,436 hectoliters were exported. In the same year alcohol in France was utilized as follows:

For drinking	1,558,234 hectoliters or 54.8 per cent
For vinegar	50,466 hectoliters or 1.8 per cent
Denatured	724,249 hectoliters or 25.4 per cent
For treating wine	95,395 hectoliters or 3.3 per cent
For export	299,266 hectoliters or 10.5 per cent
For miscellaneous	120,327 hectoliters or 4.2 per cent
	<hr/>
	2,847,937 100.0 per cent

But from the outbreak of hostilities, the enemy occupied a part of French territory in which many distilleries were situated, and the Government was obliged to take serious thought how to procure the alcohol needed for purposes of national defense. The capacity of output of the distilleries that remained unoccupied by the enemy was increased, and they were adequately supplied with grain and sugar. Moreover imports increased rapidly during the first three years of the war. Table 41 gives the chief features of the production and consumption of alcohol during the war.

TABLE 41
PRODUCTION OF PURE ALCOHOL (HECTOLITERS)

Year	Output of ten de- partments affected by invasion	Output of other departments	Total output	Imports	Exports
1913	1,939,505	1,014,403 ²	2,954,000	180,432	283,336
1914	848,084	806,215 ²	1,654,000	179,511	219,462
1915	732,190	1,255,247 ²	1,987,000	445,930	149,329
1916	630,206	927,449 ²	1,558,000	1,263,020	126,249
1917	627,062	864,446	1,491,508	1,399,611	67,638
1918	236,531	595,791	832,322	633,683	33,512
1919	231,331	589,887	821,218	639,390	142,008
1920	370,159	924,797	1,294,956	643,647	303,635

¹ Hectoliter = approximately 22 gallons.

² Including some 220,000 estimated output not under supervision in 1913; 200,000 in 1914; 319,000 in 1915; and 118,000 in 1916.

The following was the situation of the principal sub-groups of the food industry down to July 1917, when control became general. It may be noted, to begin with, that the industries supplying the food of the army were particularly active from the very outset. There was no unemployment in the great milling factories, mills were requisitioned and their staff strengthened by men provisionally released from military service. Bakeries were at times overtasked, baking as often as ten times a day. Meat-preserving factories worked without respite; it was the same with chocolate works and so forth.

Flour-mills working for the army were employed to their full capacity from 1915 onward. Those which worked only for private customers were short of staff and lacked facilities of transport; they were in danger of running out of grain, which was subject to requisition; and some among them had to stop work for 12 hours in the 24 for lack of skilled workmen to run machinery, to groove cylinders, etc. Inconvenience was caused by the scarcity of labor capable of handling heavy weights. At the beginning of 1916 the production of the great flour-mills in particular continued to be pressed to the utmost; the exemption of their workmen from service was maintained, they worked day and night, and efforts were made still further to increase their output. The smaller mills, on the contrary, were hampered by the difficulty of procuring wheat and by the scarcity of labor. The mills of Marseilles now worked only to order, could no longer export flour, and lost, in Egypt, an important customer. In all areas, including Marseilles, work revived in January 1917, because the military authorities provided men to run machinery and to do the heavy labor. The difficulty of obtaining supplies by sea did indeed continue to entail frequent stoppages, but these became serious only after July 1917.

Factories producing *farinaceous pastes* maintained their activity after the mobilization, notably by employing refugees and by importing semolina from America. Notwithstanding the scarcity of labour, some largely exceeded their normal output. They were however hampered by having to utilize hard wheat from Africa and North America in lieu of Russian and Roumanian wheat, and, in some instances, by the loss of part of their female staff, who accepted employment in military establishments; also by the prohibition of

export, and by the lack of railway trucks. To meet the ever increasing demand, they had recourse largely to the labor of women and children.

Among the countries that are large producers of *sugar*, France suffered by far the most during the war, as she lost two-thirds of the factories in which she produced home-grown sugar, and her output was reduced to one-seventh of the normal. (Detailed figures are given above, pp. 112-113.) At first, after the mobilization, sugar production proceeded in an almost normal manner, in spite of the departure of many of the highly skilled workmen. But in the following years the area under sugar-beet and the yield per acre were largely reduced owing to scarcity of men and fertilizers.

At the beginning of 1915 *sugar-refineries* were working at full power. The refinery at Châlon-sur-Saône was employing labor from Kabylia; three important refineries at Marseilles, employing altogether 2,700 hands, were mainly engaged on refining foreign sugar, and when the Italian mobilization occurred, replaced their Italian workmen with Spaniards and Arabs. But as the 1915 crop of sugar had been a thoroughly bad one, the refineries, although they had plenty of orders in hand, reduced their output and their staff. Those at Marseilles, for lack of means of transport, found it difficult to export to the colonies, and reduced production by one-third; the coal imported from England, moreover, was very costly.

When sugar-factories and beet distilleries prepared in July 1916 to deal with the crop of that year, they found difficulty in obtaining skilled men to repair their machinery; then the scarcity of labor involved delay in getting in the crop, and manufacture was hampered by the same cause; female labor was employed to a large extent. The refineries passed through a period of extreme depression in 1916. There was a shortage of raw material, no cargoes coming in from the West Indies, owing to the lack of sea-transport; and hands had accordingly to be discharged. The Bordeaux refineries could no longer export to Africa, but those of Marseilles worked tolerably. From 1917 onward, after the fixing of wholesale prices for sugar, this uneasy situation became more acute; many refineries closed down, others produced only the more remunerative types of sugar. Only those of Marseilles, which were receiving cane-sugar of good quality, gave rather more than the normal output.

Of all the food industries, *brewing* is that which suffered least from the general mobilization. The annual output of the breweries before the war was estimated at 350 to 370 million gallons, of which seven-tenths came from the north of France. For several years imports of beer into France, mainly from Germany, had tended to diminish, while exports were increasing. During the war, although the invasion incapacitated some 1,200 breweries, the remainder were able to increase their output, and new breweries even were started.

From the beginning of 1915 the great breweries of the east were operating normally; they engaged supplementary staff, including refugees. The Dunkirk breweries, in spite of work at high pressure, could not cope with the demand from the British army. No brewery was idle, and the numbers employed in the industry were almost as large as before mobilization. These excellent conditions prevailed throughout 1915, in spite of the high price of fuel, of the slowness of transport, and of the scarcity of barley and hops. In 1916 the personnel employed was larger than before the war, but the breweries could not meet all their orders; they were hampered in the matter of transport and of barrels and bottles; they suffered also from the shortage of malt, although malt-houses were working to their full capacity. In 1917 there are reports, here and there, of the extension of a brewery, of an increase of personnel, of the employment of women, and of the starting of new breweries. Malt-houses were equally prosperous. A company, moreover, was formed to liberate breweries from their dependence on Germany; for all supplies of brewing plant had hitherto been monopolized by the German mechanical industry.

The *Champagne wine* industry showed considerable activity at Épernay from the beginning of 1915, and this increased progressively, although normal conditions were never quite attained: there was a shortage of staff familiar with the handling of champagne; representatives of the various firms found difficulty in travelling about; consignments by rail were not despatched with regularity; above all there was a scarcity of bottles, nearly all the glass-works being in the invaded region. In Anjou and the Tarn the important sparkling wine industry was in part brought to a standstill at the beginning of 1916 by the lack of skilled labor, of sugar, alcohol, and bottles. The output of sparkling Saumur wine was considerably

reduced; whereas in 1913 it produced 8 million bottles (of which 2,600,000 was for export), in 1915 these figures were reduced to 5 million (of which 1,500,000 was for export). In 1916 and the early part of 1917 the great champagne firms of Épernay, who had received numerous orders (for export to England and America), were employing nearly their full personnel, in spite of the difficulties with which they were confronted.

In *Liqueur-factories* work was plentiful, owing to numerous orders from abroad; but supplies of alcohol, as a result of requisitions, were extremely difficult to obtain. Only the factories engaged on army contracts were working normally, and those producing vermouths and 'apéritifs'—this in consequence of the prohibition of the sale of absinth.

On the other hand work in *wine distilleries*, which was only moderate in 1915, diminished seriously in 1916 owing to the high price of raw materials—sugar, packing-cases, and bottles (the cost of which had increased by 100 per cent); the price of industrial alcohol in particular had become prohibitive. Distilleries of wine-pressings in the Hérault and the Aude were idle; those of Rouen were working normally.

In *cheese-factories*, recovery after the mobilization was somewhat slow (defective transport facilities, scarcity of horses for collection of milk). But the Roquefort cheese industry, in which women were employed, remained extremely active. In 1915 the dairy output diminished, owing to an appreciable reduction in the number of cows since the outbreak of war; but the position of cheese-factories, particularly Roquefort, remained excellent, for the price of cheese was high. Cheese- and butter-factories continued to be actively employed during 1916, and even apparently increased their personnel; but the increase was due to the fact that, women and children being less vigorous than men, more of them were needed to do the same amount of work. At the end of 1916 the Roquefort cheese industry, hampered by the requisition of sheep, was obliged to reduce its output; but the manufacture of casein was maintained very briskly. The production of preserved butter was much developed.

The manufacture of *preserved meat, fish, vegetables, and canned fruit* gave rise before the war to a considerable export trade from France. In 1913 she was in a favorable position in respect of potted

game: exports of '*foie gras*' were large and increasing; exports of dried vegetables amounted to seven times the imports of the same. But French exports of sardines had fallen rapidly since 1900, while her imports increased. As for tinned meat, imports, after having dropped considerably up to 1905, had then increased, until in 1913 they slightly exceeded exports. Appendix XXV indicates how the commerce in this article developed during the war.

Preserved meat factories, working as they were principally for the army, recovered their full activity in all districts immediately after the mobilization. The recovery was less good in respect to *preserved fish*. About July 1915 the preserved meat business showed some weakening, because a maximum staff had been employed to produce considerable stocks in a short space of time. The output of *preserved vegetables* however increased, and factories were able to retain the whole of their civilian staff. In the following period tinned meat remained in good demand; although the more expensive lines fell almost completely out of favor, the ordinary qualities in small tins were much sought after, for sending to the troops at the front or to prisoners in Germany. But output was limited by the shortage of tins and the scarcity of skilled labor (tin-smiths and cooks). In the Bordeaux and Toulouse areas, indeed, the meat-preserving trade slackened again perceptibly at the end of 1915; one factory even was converted to shell-production. As regards the canning of fish, lack of ice made it sometimes impossible to forward catches in good condition. It may be noted that at Boulogne-sur-Mer, although it had not been possible to equip all available fishing-boats for want of qualified hands, the average catch was exceeded by a third, thanks to the abundance of herrings. But canning was checked by the scarcity and above all by the high price of other requisites.

In the early part of 1916 the diminution in the output of tinned meat became more pronounced. The army reduced or suspended its orders. Moreover the price of meat, particularly of pork, had become very high; and, further, many manufacturers were unable to keep their female staff, for the munition factories, paying higher wages, were gradually drawing the women away. Fish-canning factories likewise found themselves restricted, owing to the calling up of fishermen. Conditions remained uneven during 1916; no attempt

was made to maintain the large stock of preserved food formed in 1915, although this was diminishing; nevertheless some important factories were working at normal pressure. And a meat-extract factory was started, to oust German firms from the monopoly that they had secured in France before the war.

As regards preserved vegetables and fruit, there were the usual fluctuations according to the abundance or poverty of crops; sugar was scarce, the cost of packages very high, and export was checked by the prohibition of the export of food-stuffs; freights moreover were too dear. At the end of 1916, notwithstanding these difficulties, the preserved food industries were in a fair way. In spite of the competition of munition factories, they were recruiting numbers of women, who, thanks to the improvement of machinery, were able to take over men's work (sealing up tins, management of chopping machines, electrical installations, etc.).

Chocolate-factories returned to normal conditions after the mobilization; they were soon overwhelmed with orders and found difficulty in delivering up to time, although their staff, almost entirely female, was above the average in numbers. *Confectioners and jam-makers* likewise were soon fully employed; but makers of candied fruits were hampered by the poorness of the crop (1915), by the increased prices of sugar, of glucose, and of fuel, and by the lack of skilled labor. At the end of 1915 chocolate-makers and confectioners were everywhere working at full capacity, engaging women and children; at Paris, a factory that had closed in August 1914 and reopened two months later with four workmen, was employing 400 at the end of 1915, as in pre-war days. The manufactories of candied fruits seem on the whole not to have suffered, thanks to their exports to England and America, which they were able to resume.

Factories producing chocolate, confectionery, and candied fruits remained normally busy until the middle of 1917, in spite of the prevalent causes of embarrassment. They were checked, however, in the Nancy-Verdun region, by military events; and exports to America were slightly reduced by the dearth of freight, and to England by the prohibition of the import of candied fruit into that country.

As regards the *manufacture of biscuits*, a firm at Calais, con-

tractors to the army for the supply of war bread, increased its personnel by one-third immediately after the mobilization; and many factories gave up the production of superior qualities to manufacture war biscuit. By the beginning of 1915, biscuit-making had everywhere reached the pre-war degree of activity. The demand in France for biscuits and gingerbread was considerable, as large quantities of these articles, which keep well, were sent to soldiers and prisoners; factories reached or exceeded their normal output, notwithstanding the scarcity of labor, particularly skilled labor, and the lack here and there of certain articles (sugar and eggs, almonds, and very fine flour). From the Dijon and Toulouse districts, biscuits were being exported to the army at Salonica. At Nîmes and Alais factories could not cope with their orders. New factories were being built and others enlarged. Manufacture was being carried on almost exclusively by women, who undertook jobs for which they appeared wholly unsuited, rolling and cutting paste, minding waffle-irons and ovens. The lack of tin boxes was made good by the use of small wooden cases or by adapting other packages. But these prosperous conditions came to a sudden end in 1917.

Of all the branches of food production, it was *Baking* that was the most adversely affected by the scarcity of male labor that followed the mobilization; in the Tarn, for instance, out of every three bakeries, one closed its doors, one worked normally, and one partially. But goodwill did wonders: old hands came back to work; in many places the baker's wife got the baking done, either single-handed or with the help of her children; the principal remedy for the situation, however, was found in the general and intensive use of mechanical kneaders. Everywhere women and young people under 18 took the place of the men called up.

The factories for drying *chicory* in the departments of the Nord and the Pas-de-Calais did not resume work until the end of 1914, when the critical moment of the enemy offensives was past; on the other hand a chicory-factory in the Meurthe-et-Moselle succeeded in replacing its mobilized personnel and at once set to work more actively than in normal times. The scarcity of chicory on the market soon brought about a rise of price of 50 or 60 per cent, for the great factories of the Nord were included in the invaded territory; as a result, six new factories were opened in the Dunkirk district,

others in the Hérault and the Aude; roasting-works were started in the Rouen area, the first of the kind in that region. By the end of 1915 the effort made by the chicory manufacturers to replace the works occupied by the Germans had proved completely successful, and some remarkable commercial enterprise was already being shown in the matter of export. Within five months a single firm had set going afresh a group of drying and refining works, employing a staff of 800. In July 1916 the opening of a chicory-factory was reported in the Paris district, and later the opening of another near Calais; henceforth the industry remained extremely prosperous.

The *Mustard-factories* of the Dijon area were short of personnel from the time of mobilization, and above all of glass pots. They ran at first at only half their capacity. Then, as orders poured in, they attained three-fourths of their normal output in spite of the shortage of male labor, which was replaced by women. Subsequently production was maintained at 60 per cent of the normal, for vinegar was very dear and mustard-seed, mostly imported from India, very scarce.

To sum up, until July 1917 the situation of the food industries was, generally speaking, favorable, although some, such as the sugar industry, suffered grievously. But from this date a serious change came over the position. The difficulties of supply, the scarcity of coal and sugar, the lack of means of transport, and as a consequence the measures of control of growing severity, began to limit industrial activity. At the end of 1917 the index-number of food-producing establishments in operation remained the same as before (92 per cent), but their work had diminished perceptibly and become intermittent, and they had even begun to reduce staff. During the first half of 1918 fresh restrictions impaired the activity of certain branches that had hitherto retained their prosperity: in order to reduce the consumption of wheaten flour and sugar, and to save milk for children and old people, decrees were promulgated prohibiting the manufacture and sale of pastry and biscuits, of confectionery, sweet dishes, ices, and certain kinds of condensed milk. The consumption of cheese was also restricted.

Not only was white sugar rationed, but also brown sugar, treacle, cocoa, chocolate, and certain beers. And so although in the first months of 1918 the index-number of establishments at work had

dropped only a few points, there was a marked fall in the personnel employed. From 83 per cent in 1917 it declined to 74 per cent and then to 66 per cent in 1918.

Taking the sub-groups individually from the middle of 1917 until the after-war period, we find that, grain being controlled, and the production of flour and offals registered, *Millers* were working exclusively to order on grain supplied either by the Army Commissariat or the civil Food Department. As the supplies of wheat were neither regular nor sufficient, mills were working only 4 or 5 days a week, and their output had fallen to two-thirds of the normal. Labor Inspectors everywhere drew attention to this irregularity of work; some mills closed down completely, others employed one shift instead of two and stopped night-work. There were complaints too of lack of coal. Only in the districts of Limoges and Rouen were flour-mills working normally. American wheat, arriving by the Atlantic ports, was absorbed by the mills of the east and south-west; the mills of Marseilles found less employment.

This situation grew worse during 1918; the only mills fully employed were those grinding barley and buckwheat, the flour of which was largely used for bread-making. Happily at the end of the year, thanks to the good harvest and to arrivals of foreign wheat, milling was resumed more actively and night-work started again. But checks still occurred, owing to delay in the arrival of cargoes and to lack of fuel.

In 1919 the transport of grain, thanks to the priority accorded to it, was effected more regularly. Intense activity was displayed in certain districts: some mills increased their output of semolina, for which a ready sale was found; others extended their premises and improved their plant so as to deal with maize. In some the personnel, which had fallen in 1918 to 50 per cent of the pre-war figure, recovered to 75 or 80 per cent. At the end of 1919, the position remained uneven: some mills were working regularly and equaling their pre-war output, but many others were suffering from the difficulty of transport, the lack of fuel, and the short crop of 1919, which moreover was unequally distributed. Output was in some districts reduced by a third.

Acute depression overtook, in 1917, the manufacture of *farinaeous pastes*, leading in many instances to the discharge of half the

personnel and to the reduction by half of the output; the use of semolina made from soft wheat had been forbidden, and the Food Department was unable to provide manufacturers with the required quantities of hard wheat. The high price of the product contributed to bring down the demand. In some factories the monthly output dropped from 200,000 to 50,000 kilos; others (makers of vermicelli) closed down altogether; the personnel of one large factory fell in April 1917 from 700 men to 50. There were one or two exceptions where conditions were specially favorable, or the manufacturer showed special enterprise. About June 1918 there was a slight recovery more or less everywhere, thanks to distributions of flour, of millet, and of semolina. But the flour employed was of poor quality (it included 10 per cent of substitutes) and did not keep well. To prevent a recurrence of unemployment the syndicate of manufacturers concerned proposed to import at their own charges hard wheat from Algeria, Tunisia, and Morocco, and to build up a reserve. Certain works were converted and undertook the preparation of leguminous flour; one factory, which exported diet breads and pastes to England, Italy, the Balkans, and America, was working to its full capacity and planning to oust German and Austrian products after the war. However, by the end of 1918 the manufacture of farinaceous pastes was confined to contracts for the Commissariat and the Food Department. The measure of recovery in 1919 was determined by the degree of regularity in arrivals of semolina and hard wheat. In some districts output became nearly normal again and sufficient labor was available. Some factories that had been closed since 1917 were reopened. By the end of 1919 the situation as a whole was normal.

As regards *bakeries*, the decree of the 10th February 1917, prohibiting the sale of new and fancy bread, did not much affect working conditions; in certain areas the substitution of day-work for night-work gave rise to no difficulty; in others night-work continued; most shops closed for a few hours each day. But the chief cause of inconvenience was the increase of 60 per cent in the price of fuel for heating the ovens. The demand for bread diminished, especially in the country districts, when mixed flours were introduced, for many farmers started baking their own bread. On the other hand, bakeries were working double shifts in towns where war factories

had developed. The insufficiency of wheat cargoes from La Plata and Manitoba obliged a large gluten bread factory to reserve for Paris the output it previously exported to America, England, Spain, and Morocco.

New restrictions in November 1917 led to an appreciable reduction of output; the manufacture of fancy breads and of certain diet breads was strictly controlled, and bakers were forbidden to produce pastry. Some bakeries closed down; others replaced staff by mechanical bread-kneaders, the use of which became more and more general.

By the beginning of 1919 the industry had resumed its normal course, except for irregularities in the arrival of flour; but working hours had been slightly reduced. The staff that had proved superfluous during the period of restrictions and had taken employment elsewhere, returned to the bakeries. The labor supply had become smaller, but the use of bread-machines was now so common in certain districts that workmen refused employment if they were required to knead by hand. An oven of Swiss design, which could be heated with any kind of fuel, gave excellent results, employing two men where four were previously required.

Pastry-cooks were much affected in 1917 by the measures of control. The prohibition of the use of wheaten flour for pastry-making and the closing two days a week of pastry-cooks' and confectioners' shops were followed by the decree of 30th November 1917, which forbade the consumption of pastry on shop premises and the manufacture of pastry and biscuits from the flours of wheat, rye, maize, barley, etc. Many pastry-cooks closed down partially or entirely, especially in rural districts, but they still had numerous customers in the towns.

When a fresh decree (12th February 1918) forbade the manufacture and sale of all pastry, whether containing eggs or not, except for the Commissariat, and another prohibited the sale of gingerbread, many pastry-cooks stopped work; others took up various trades, sold dried fruit or early vegetables, groceries, jam, or post-cards, or opened tea-shops. The larger establishments endeavored to produce cakes containing neither substances that rapidly deteriorated, sugar, nor syrup, made use of chestnut flour or rice, or prepared cooked dishes.

A certain uneasiness persisted after the war, for the pastry-cooks that reopened found it difficult to obtain sugar. But by the middle of 1919 there was a general recovery, and at the end of the year customers were plentiful, and were not deterred by the high prices.

The ordinances of 1917 had a particularly severe effect on *biscuit-factories*. Many had to stop work or reduce staff, for sugar was sparingly dealt out to them and manufacture was complicated by the employment of rice and manioc flours, which tend to go mouldy. Reductions of one-half or two-thirds were reported on all sides. An important factory in Brittany was employing a staff of 464 where there had previously been 1,357, and even more striking figures were reported. But the hands discharged easily found employment in munition factories. A few biscuit works managed to survive by manufacturing war bread; those supplying the army and navy were kept busy; in a few exceptional cases, the staff employed was larger than before the war.

Gingerbread makers, likewise, were hampered by the requisitions of flour, except where they had prepared a stock of paste by mixing the flour and honey in advance, and these found it extremely difficult to make use of substitute flours.

By the middle of 1918, apart from firms manufacturing war bread for the troops and prisoners of war, which were doing well—a factory was reported as working exclusively for the American Commissariat—most factories had seen their business brought to a stop or broken up. A few factories had adapted themselves to the circumstances by utilizing chestnut or manioc flour, by developing the manufacture of farinaceous pastes, and by replacing sugar by honey or fruit juice. After the Armistice, the manufacture of biscuits recovered, but a few factories that were still working for the American Commissariat did not immediately take up the production of expensive biscuits. Later the situation improved rapidly and orders poured in, their execution being limited only by the inadequacy of supplies of sugar, butter, and eggs. The biscuit and gingerbread works of Rheims, which had been closed since 1914, resumed operations after the provisional repair of their ovens. The situation continued to improve during 1919 and exports began afresh.

The *preserved food industry* encountered fresh difficulties in

1917. Besides the various impediments already indicated as prevailing in the earlier years (lack of tins and bottles and of skilled hands, and the competition of munition factories, which offered higher wages for women's labor), the scarcity of coal obliged manufacturers to have recourse to wood; but this was costly, required much handling, and became scarce. Attempts to re-seal old tins failed. The value of the container came to be out of all proportion to that of its contents.

For preserved meat factories the year 1917 was favorable. Those working for the army followed an even course, which continued unaltered until the middle of 1918, when there was some slackening owing to the use of refrigerated meat at the front. Other factories, being less advantageously situated, were nevertheless actively employed, often more so than in peace-time, except as regards canned poultry and *pâtés de foie gras*. The application of the decree concerning meatless days did not inconvenience them to any great extent, because slaughtering was authorized daily for their needs, the limitation relating only to the total number of beasts slaughtered each week. A large slaughter-house was opened in 1918, where butchers' meat was prepared and dispatched in refrigerated wagons. The salt meat factories of the Hérault were very busy, considering the high prices prevailing, ham having risen from 2 frs. 50 to 8 francs the kilo.

In the early part of 1919 meat-preserving showed little activity, owing to the dearth of cattle and the prohibition of the canning of pork. Army contracts had been completed, stocks were large and orders few. Many firms closed down or reduced their staff. But a factory working for the liberated region enjoyed exceptional activity, and orders for 'Lyons sausage' were numerous. Dullness continued during the first six months; toward the end of 1919 orders for tinned meat were fairly plentiful, but factories were unable to execute them and slack trade still prevailed, because curing works were short of tins (some were imported from England but proved too dear) and of raw materials. In curing works at Toulouse, output was only 25 per cent of the normal and American-cured meat was used for canning.

The *canning of fish* was faced in 1917 with the same difficulties as analogous industries; it suffered especially from the lack of tins

and of bait for sardines; from the impossibility, in the circumstances, of fishing for tunny and large mackerel; and from the difficulty, owing to the submarine campaign, of fishing for cod. Exports were forbidden and the whole output remained in France. However the late autumn of 1917 was favorable for fisheries and the canning industry profited in consequence. The herring-fishery having done well in the north-west, the salt herring industry was active at Fécamp and Boulogne.

In July 1918 the industry was at a standstill so far as tunny and sardines were concerned. In the Pyrénées-Orientales, anchovy salters could work only by importing anchovies from Spain subject to an import duty of 25 per cent.

In 1919 there was again a dearth of sardines and many factories on the Atlantic coast opened for only a short time or not at all, nor did the cod fishery resume its activity. But the curing works on the Channel coast found occupation with herrings. Normal conditions were restored at Boulogne, and by the end of the year there was a tendency to general recovery, in spite of the high price of coal and of labor.

The *preserving of vegetables*, amid the difficulties of the period, varied chiefly with seasons and crops. Work was uneven in 1917, and generally scarce in 1918 owing to the drought, notwithstanding orders from the Commissariat. Still, great activity was reported in the Vaucluse, notably in the canning of tomatoes, and factories were started or extended; several works were also opened for treating cabbages, carrots, and potatoes, so that they could be utilized during winter. Business was moderate during 1919; certain districts suffered from drought, and army contracts had come to an end. Many undertakings added the drying of vegetables, which was to prove very unremunerative, to their ordinary operations. Four new drying works were opened in Brittany and began export.

As regards the *canning of fruit and jam-making*, the crop was good in 1917, bad in 1918, moderate and uneven in 1919. The lack of jars and sugar limited output where fruit was abundant, except where factories worked for the army. Exports to England and America were reduced by 50 per cent in 1918. The drying of fruit was tried in order to dispense with sugar, and was developed in 1919.

The *sugar* season of 1917-1918 was comparatively favorable in various regions. Sugar-factories, which were inadequate in number in the area free from invasion, profited by the urgent demand for sugar. They received as much beet as in 1916, coal was distributed in due time, and labor was plentiful. There were 3,600 acres under beet in the Vaucluse in 1917 as against 3,200 in 1916; a factory in the Rouen area reported 7,200 tons of sugar as against 4,600 in 1916 and 1,600 in 1915. Six other factories in the Paris area produced 13,000 tons against 11,500 in 1916. Unfortunately, in other districts the crop was light. Around Lyons manufacture terminated a fortnight earlier than usual, and in other parts lasted a third to a half of the normal period. At Nancy only four factories out of seven were at work.

In 1918-1919 the beet crop was poor owing to shortage of labor, and the production of sugar (which terminated by the end of December in all the factories of the Paris area) was in general indifferent. Moreover in the beet-producing districts (Somme, Oise, and Aisne) military operations had hampered cultivation.

The sugar industry, which was centered to a large extent in the invaded region, did not readily recover after the war. At the end of 1919 out of 93 factories situated in three devastated departments, only five had resumed work. A sixth, while waiting for machinery, was making cattle-food of molasses and bran. Moreover, as the beet crop had been moderate, the manufacturing season was short. In the south the factories suffered from shortage of coal.

The position of *sugar-refineries*, after the adoption in 1917 of measures of control, was distinctly less favorable than that of the factories: (1) they had difficulty in obtaining labor, the fixed price of sugar no longer permitting, they said, the payment of adequate wages to the workwomen—in three refineries in a single town the staff dropped from 626 to 486; and (2) coal was very scarce and wood to replace it could not be transported. Nevertheless refineries worked normally in the Marseilles area, and a refinery in the Paris area, which had reduced its staff by 50 per cent, reverted to full numbers. During 1918 however the position of the refining industry became daily more critical, owing to the high cost of production, shortage of raw sugar and coal, and dearth of wood. A firm employing 150 hands closed in April, others restricted their operations and

attained only a third or a half of their normal output. After 1918 the activity of refineries was still further reduced by the difficulty of procuring raw sugar and fuel.

The rationing of sugar allowed *confectioners* to produce only one-quarter of their pre-war output; in general, they made chocolate, jam, and pharmaceutical products, instead of sweets. Manufacturers of *candied fruits* restricted their purchases of fruit, which was allowed to waste for lack of sugar. Moreover export had become impossible, and coal was scarce and dear. The depression was made more acute by the prohibition of consumption on shop premises, and by their closing two days a week; and many factories ceased work.

The situation was unchanged in 1918. There was a recovery in 1919 in spite of control; an effort was made to export jams and syrups from the Lyons area to supplant German and Austrian products; sugar was imported at a very high price to meet the influx of orders. The recovery was hampered, so far as the candied fruit of Provence was concerned, by the high rate of wages and the price of fruit, and by the competition that had developed in England and America. But the manufacturers undertook a complete remodeling of their plant, which by reducing the time and staff required for their processes would allow them to meet foreign competition successfully. At the end of 1919 jam-factories were fully occupied in Auvergne, and it was the same with confectioners practically everywhere. Jam-making was proving profitable, although fruit and sugar were still scarce, and jam placed on the market from American stocks was coming temporarily into competition.

Down to the middle of 1917 *chocolate-factories* were working at full capacity; a factory situated in a town exposed to frequent bombardments worked regularly at night and managed to produce a ton of chocolate per day. Toward the end of 1917 all this activity was reduced. As a result of the new restrictions, raw materials (sugar, cocoa, coal) were sparingly allocated to chocolate-factories, even to such as had contracts with the Commissariat. Some factories closed or reduced their staff; output was reduced by half at Lyons and almost entirely ceased at Dijon. Manufacture, however, continued in many places. During 1918 all chocolate produced was promptly disposed of, although the decree of 12th February 1918

had laid down that chocolate of ordinary quality, the only quality authorized, should not contain more than 36 per cent of cocoa. Factories were kept busy only by contracts for the army, which supplied them with sugar; only one-fifth of their output went to private customers.

Restrictions on the use of sugar were in part withdrawn after the war, and there was considerable demand for chocolate. But coal was scarce, and the price of cocoa increased by 100 per cent in six months; the Food Administration supplied inadequate quantities of sugar, and foreign sugar, besides being very dear, was not easy to procure. Nevertheless, most factories had set up new machinery of great efficiency, and there were good prospects of development. At the end of 1919, work was everywhere active, and many firms were contemplating improvements and reorganization.

In *starch-works* output was below the normal during 1917; being unable to procure potatoes easily, they were utilizing manioc roots and sago. But supply was hampered by difficulties of transport. One or two works closed during the whole of the year or intermittently. In 1918 importation of manioc had become almost impossible and the personnel of starch-works was employed on cleaning and repair jobs. In 1919, as the last potato crop had been a poor one, the Food Minister forbade the conversion of potatoes into starch or glucose; only diseased tubers might be so used, which permitted of the employment of the staff during three months. Meanwhile the scarcity and high cost of freight prevented the import of sago and manioc. There was a slight recovery at the end of 1919.

We have seen that numerous *chicory-factories* were set up and prospered in the non-invaded regions of France. They were hardly affected by the crisis of 1917. Whereas the total area of chicory grown in Belgium, the Nord, and the Pas-de-Calais was 17,600 acres in 1913, at least the same area of chicory was grown in 1917 in the non-invaded portion of the Nord and Pas-de-Calais alone. Roasting-works were transferred in 1918 from the Nord to Brittany and Normandy, and new chicory-factories were started and were kept fully employed. These new factories maintained their activity after the war; the factories in the northern departments, which were destroyed by the Germans, have, indeed, not yet been rebuilt.

The working of *alcohol distilleries* was seriously hampered in

1917 by the difficulty of obtaining supplies of grain or of beet: of the former, owing to the reduced area under grain; of the latter, because beet was allotted by priority to the sugar-factories. A distillery employing 50 hands contemplated closing, having exhausted the stock of maize and rice supplied by Government; another, in place of grain, was treating damaged flour from military stores; a third, the whole of whose output had been requisitioned by the explosives service, had ceased work in April 1917, for lack of grain.

Distilleries of wine-pressings were doing well; residues though dear (7 frs. 50 the kilo, as compared with 3 francs to 3 frs. 50 before the war) were plentiful, and the alcohol at 90° extracted therefrom was very remunerative at 500 francs the hectoliter (22 gallons). But this industry declined in 1918. Three factories that had been erected in Brittany to distil alcohol from apples for the manufacture of explosives, undertook after the war the production of pure cider, an industry of considerable importance for the district, and capable of leading to exports.

Distillers of liqueurs, from 1917 onward, saw their business more and more restricted. The requisition of industrial alcohol, already of long standing, followed by that of sugar, had forced them to have recourse to alcohols made from grapes or wine-pressings, which were very expensive. Coal and, above all, bottles were scarce. An important firm in the Paris suburbs, which consumed 3,252 hectoliters of alcohol at 100° in 1916, consumed only 2,417 in 1917. Manufactories of well-known liqueurs were idle. A few districts however were able to increase their exports, particularly to America.

During 1918 most producers of liqueurs were obliged to reduce their output, in consequence of the high duties on alcohol and sugar. Nevertheless it was found possible to continue the export of an important brand from the Toulouse area.

The recovery of alcohol distilleries in 1919 was slow, except as regards those treating wine-pressings, which enjoyed a normal season; distillers complained of the control and of the irregularity of transport; there was a lack of fancy bottles for special brands of liqueurs; and so on. In July many factories were idle because alcohol and sugar were scarce and their price was continually rising. At the end of 1919 some grain distilleries were reported idle as a result of the new regulations concerning the manufacture of alcohol,

and the prohibition of the use of industrial alcohol as potable alcohol; certain factories were adapted to new processes, such as the production of yeast, and the retting and scutching of flax. The demand for liqueurs and potable alcohol was abundant, and exports of them took place.

Vermouth-factories were busy in 1917; they developed and exported largely. But the production of *apéritifs* and tonic wines with cinchona base was affected by the control. The output of an important firm was reduced from 110,000 hectoliters before the war to 60,000, and it had ceased to export owing to the difficulties of sea-carriage. Nevertheless the cinchona factories of the Paris area were working normally.

In 1918 the vermouth-factories maintained their prosperity. They obviated the lack of sugar and alcohol by having recourse to special wines, and their exports slightly exceeded the normal. Their total output reached 80 per cent of the normal, and in 1919 far exceeded it, and tended to develop still further.

As the apple crop was abundant in 1917, the *cider-factories* of Normandy worked at their full capacity, even engaging Algerian and Spanish labor for the season. In the Limoges area there was a shortage of casks. In that of Nantes an important cider-factory was established with a distillery attached to it, where apples that were formerly exported to Germany were pressed to the extent of 16 tons a day; these were converted into alcohol for munitions purposes. The crop of 1918 being distinctly poor, a decree forbade the distillation of cider and perry from the 15th July to the 15th September 1918. But the distillation of apples had yielded: in 1915-1916 230,000 gallons, in 1916-1917 339,000 gallons, and in the following season up to the date when the decree was promulgated, 1,510,608 gallons.

In 1919 cider-factories showed a general recovery; the use of mechanical presses was extending.

In *Champagne wine factories* output, in 1917, varied from one-half to one-third of the normal; consignments, especially to South America and to the front, were proceeding actively, but were limited by the scarcity of suitable bottles. The manufacture of *sparkling wines* was being carried on with a reduced staff, and was prospering in certain districts. In June 1918 the great champagne firms, which

till then had been operating with a reduced personnel, were obliged to suspend work for several months, only to resume as demobilization proceeded.

For the reasons already stated, breweries were doing well in 1917. In the Toulouse area brewers had increased their staffs by one-third, and in that of Limoges their output was 30 per cent above the normal. The increase was still greater in 1918, for they were then supplying the American army. Prices were remunerative (40 francs the 22 gallons in June 1917 as against 16 francs in 1914); pale ale and stout were selling profitably to the British troops. But great obstacles were reported. Coal was short and transport difficult, as all industries found. Moreover the price of malt had risen from 32 francs before the war to 160 and even 225 francs the 100 kilos; barley, whose fixed price was 31 frs. 50 the quintal (220 lbs.), was fetching, when it could be found, 80 francs the quintal. Certain breweries were obliged to restrict their manufacture to the quantity of barley coming in, and to suspend export; one malt-house ceased work for three months, and there was a general shortage of malt.

In 1918, by an *arrêté* of the 2nd February, a Committee was charged with the distribution of barley among the brewers, and all the malt produced in France was allocated by the Food Department; it amounted to only 50 per cent of the quantity available the previous year. While waiting for American malt, which arrived irregularly, breweries worked intermittently or were idle. Several breweries substituted rice for malt, but the resulting beer was indifferent. Accordingly, whereas the brewing output of 1916 and 1917 had been normal, that of 1918 was distinctly below that of pre-war time.

In 1919, there were the same abundance of orders and the same causes of embarrassment, notably the lack of malt and hops and their high price. Beer, whose price was controlled, competed easily with wine, which was expensive, and cider, which was scarce. In the second half-year the departure of the English and American troops reduced the consumption, which fell 30 per cent below that of the corresponding period of 1918 in the Lyons area. But the supply of barley and malt was freed from restrictions, and Alsatian hops came into competition with those of Burgundy; at the end of 1919 the situation was tending to become normal. The breweries of the

Nord, which had been stripped by the enemy of their copper utensils, were working with a reduced staff; some were replacing their steam-engines by electric motors.

Aërated-water factories had plentiful orders, especially from British customers; they were particularly affected by the lack of bottles and of sugar (which they replaced by saccharine). Mineral-water works were also short of bottles. Conditions became normal in 1919.

Ice-factories were working at ordinary pressure in 1917, inconvenienced only by the scarcity of concentrated solution of ammonia. These conditions were maintained or improved in 1918 and 1919, owing to the necessity of preserving the refrigerated meat imported from America.

The *milk, butter, and cheese industry* had abundant orders in 1917 and 1918, but its output was limited by various causes. As a result of the requisition of milch cows for slaughter, certain dairies found their milk supply reduced by half. The output of the butter and cheese works of the Ariège, which had been very prosperous before the war, dropped back to the average figure of 15 years ago. Collection of milk was much impeded. The production of Roquefort cheese reached only a third of the normal, because the slaughter of lambs was restricted, and labor for milking the ewes was short.

For lack of condensed milk of French make, the civilian public was using English, Swiss, and American brands. A margarine factory in the Calais area was obliged to restrict its output, because animal fats were requisitioned for national defense purposes, and milk was consumed by the British troops, who showed partiality for it. However, dairying conditions remained favorable in Brittany and Normandy, where cheese-making was particularly active.

In the early months of 1919 butter and cheese reached unheard-of prices, for milk had become increasingly scarce; a butter-factory that used to deal with 2,200 gallons a day, now received only 330. A cheese-factory's output was reduced to one-third, and conditions at Roquefort were slow in improving.

CHAPTER VIII

CHEMICAL INDUSTRIES

As the majority of chemical industries were employed in connection with the defense of the country, they underwent important developments during the war, and a special volume of this series is devoted to them. They may therefore be dealt with briefly here, and their general features in 1913, from 1914 to the Armistice, and after the Armistice, need alone be set forth. We shall distinguish so far as practicable those working for munitions and those serving the public.

Our first table (Appendix XXVI) will show the position in France in 1913 as regards the production and consumption

(1) of the principal products of the main chemical industry;

(2) of the principal chemical fertilizers.

Explosives, with which we are not concerned, are excluded from this table.

In a second table (Appendix XXVII) we have set out the imports and exports from 1913 to 1919 of the most characteristic products; the actual output is not always ascertainable.

Table 42 indicates the variations during the war in the percent-

TABLE 42

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	59	42
Oct., 1914	70	51
Jan., 1915	77	66
July, 1915	84	79
Jan., 1916	87	93
July, 1916	89	102
Jan., 1917	89	119
July, 1917	90	120
Jan., 1918	90	119
July, 1918	91	116
Jan., 1919	90	103

age of personnel employed in the chemical industries (number employed in July 1914 = 100) according to the returns of the Labor Inspectors; it also shows the percentage of establishments at work at the date of each inquiry. The figures relate to French territory as reduced by invasion.

The returns for January 1920, relating to the *entire* territory, give as index-numbers: for establishments, 94; for personnel, 80.

It is evident from the appendices that the main chemical industry, broadly speaking, used to meet the requirements of consumption in France. But as regards potassic fertilizers and nitrate of soda, France was almost entirely tributary to foreign countries; she was also tributary to a serious extent for other nitrogenous fertilizers and for ammonia salts. The territory of France was similarly deficient in phosphatic fertilizers, but two-thirds of the deficit was made good by Algeria and Tunisia. Without reviewing every product in this rapid sketch, we may find a typical example in the dyes derived from coal-tar. In 1913 there was one factory in France that produced its own intermediate compounds; four or five obtained their raw materials partially manufactured from Germany; six were entirely in hands of German firms. Out of the 25 or 30 million francs' worth of dyes consumed in France, one-half was imported from Germany. The German predominance in this sphere was not due solely to her great wealth in coke-producing and other kinds of coal, but also to the methodical organization of her industrial laboratories. To this latter factor was also attributable her preponderant share in the supply of synthetic perfumes and pharmaceutical and photographic preparations consumed in France. Under the pressure of war requirements and also as a result of the recovery of her lost provinces, French industry showed developments in all these branches (aspirin, antipyrin, pyramidon, photographic paper, dyes, cyanamide, and nitrate of lime, Alsatian potash). Nevertheless the German industry in coal-tar derivatives still remains of great importance for France.

We may draw attention to the increase of the net imports (difference between quantities imported and exported) of commodities required to meet the needs of the army during the war: bromine, iodine, sulphuric acid, soda, sea-salt, ammonia salts, nitrates in general, dyes, tannic extracts, and incidentally calcium carbide,

soap, and fatty substances. The scarcity of fertilizers should also be noted—the reduction in the imports of potassium salts, of cyanamide, and superphosphates. As for nitrates and ammonia salts, they were not exclusively devoted at this time to agricultural purposes.

Finally, the reader will observe the large number of chemical factories reopened after the shock of the mobilization: the proportion was 90 per cent as early as July 1916; at that time the personnel employed was as large as before the war, and in 1917 was even larger by 20 per cent.

We have given in the preceding chapter (page 114) the general data relating to the production, import, and export of alcohol from 1913 to 1919, and described the activity of this branch of industry during the war (page 131, *et seq.*). We need not repeat the facts here, but we should remind the reader that alcohol is so closely connected with the chemical industry and the manufacture of explosives that it was requisitioned during the war. In 1913, 55 per cent of available alcohol was consumed as drink and 25 per cent was denatured. During the war the industrial use of alcohol was largely extended and its consumption as a beverage severely restricted.

The course of the chemical industries during the hostilities may be divided into three periods. In the first we shall note the immediate changes caused by the outbreak of war; the period extends, roughly, to the end of 1915. Then, from 1916 until the Armistice, the chemical industries underwent an unparalleled development in order to meet the requirements of national defense; we shall indicate the chief directions that this activity followed. Finally, as regards the post-war period, we shall mention briefly the modifications that followed the restoration of peace.

The principal difficulties encountered by the chemical industries immediately after the mobilization were the scarcity of labor and the dearth of raw materials. But a vigorous effort had at once to be made to reorganize such of these industries as were concerned with war requirements. By the beginning of 1915 the National Explosives Factories and many works producing sulphur, carbolic acid, sulphuric, and other acids employed in the preparation of explosives, were reported as employing already more than their normal staff. A cotton-bleaching factory that supplied one of the explosives factories had doubled its personnel; paper-works in the Ariège and

a large factory in the Vosges had adapted their plant to the bleaching of gun-cotton.

During 1915 firms producing war chemicals, and their sub-contractors, were liberally supplied by the authorities with raw materials requisitioned for the purpose, and with labor provisionally exempted from military service. The employment of women became general, and was actively developed, especially in explosives factories. Manufactories of calcium carbide in the Haute-Garonne and the Ariège added the production of ferro-silicon to their ordinary work, which was pressed on energetically. The opening of new factories for the production of chlorate of soda and of materials for explosives was reported from the Marseilles district. Perfumery works were setting up additional plants for the extraction of benzene and toluene from the commercial benzol supplied by the War Ministry. Toward the end of the year these factories were showing unprecedented activity: one had multiplied its staff tenfold and many were employing far more hands than before the war. A shell-filling factory that employed 100 women at the end of 1914 now had 500. Firework factories had doubled their staff, for the production of illuminating rockets.

Sulphuric acid, indispensable for the manufacture not only of fertilizers but of explosives, played a capital rôle in the chemical industry. Before the war it was produced by 87 factories, distributed over the whole of France; their output attained in 1913 1,160,000 tons at 52/53° on the Baumé scale, of which 5 per cent or 58,000 tons were concentrated to 66° Baumé. The manufacture of superphosphates absorbed about 950,000 tons of this. From the declaration of war all sulphuric acid factories, and notably the superphosphate factories, set to work for the army. In spite of the loss of those situated in the north of France, the output increased rapidly to meet munition requirements, and this development was already very marked in 1915. A factory at Montluçon was reported as having doubled its output; a large factory was started in the suburbs of Toulouse; others again were improving their plant in order to increase its capacity. They received powerful assistance from the Explosives Service, their principal and almost their only customer.

We may mention likewise *miscellaneous pharmaceutical prepara-*

tions, *alkaloids*, and *glucosides*, the production of which was of interest both to the army and to the civilian population, but principally to the former. Before the war, France produced the greater part of the alkaloids that she needed, but only insufficient quantities of caffeine; and she purchased abroad her whole supply of opium alkaloids.

The situation in 1913 as regards the principal products is shown in Table 43.

TABLE 43

	<i>Production tons</i>	<i>Import tons</i>	<i>Export tons</i>
Quinine sulphate	50	nil	30
Theobromine	12-16	nil	6-8
Caffeine	slight	6	2
Cocaine (chlorohydrate)	0.8	nil	considerable
Morphine (chlorohydrate)	nil	2.4-3	1.2-3
Codeine	nil	2-2.5	nil
Sparteine	0.7	nil	considerable
Helcinin	0.25	..	..
Pilocarpine	0.2	..	..

France consumed moreover 8 to 10 tons of opium, and prepared annually 45 lbs. of cantharidin, and small quantities of arecoline, eserine, etc. The war gave from the first a sharp impetus to the manufacture of drugs by withdrawing German competition. During the first quarter of 1915, however, drug factories were employing only a reduced staff, almost exclusively composed of women; but as the year advanced, conditions approached to normal, and from the end of the year there were signs of considerable development.

In *sulphur refineries* work continued on an adequate scale during the early months of the war and until the end of 1915. Greater activity was then reported, hampered by delay in the arrival of raw materials.

But by the side of the chemical factories engaged more particularly on national defense work, there were many others that supplied the public and did not enjoy the same advantages; it is with these that we are especially concerned. They suffered from the

same difficulties as the rest, dearth of raw material and labor, but in a much greater degree. As for labor, they could only have recourse to the employment of women, of refugees, and in rare instances of foreigners. Raw materials were requisitioned or their import was prohibited. For example, as the whole output of pure sulphuric acid was allocated to the Explosives Service, only the residue that could not be rectified was available for commerce, and the manufacture of fertilizers was very seriously affected in consequence, as was also that of stearin and of glue.

Oil-seed crushers, especially those working at the ports, were at first hampered by the prohibition on the export of oil-cake, a by-product of considerable value used as a cattle-food. As they were prevented from dispatching it to Scandinavia, their mills were soon congested. The temporary permission to export it to England eased the situation, and measures were taken to allow of crushers disposing of their oil-cake without detriment to French agriculture. But the limit to the quantity that might be exported was soon reached, and the mills, threatened afresh with congestion, had for a time to contemplate a stoppage of work. The closing of the crushing-mills would have brought in its train that of the soap-works, which at the time were showing a satisfactory recovery.

Soap-works, particularly those in the north, were at first short of the potassic lye and of the oil they needed, while they suffered from the accumulation of glycerine, one of their by-products. However, early in 1915 the soap-works at Nantes were already employing a larger staff than in peace-time, and even this was inadequate; at Calais they were short of raw materials.

During 1915 the output of crushing-mills and soap-works, mutually dependent industries, was improving, but still reached in most cases only two-thirds of the normal, owing to difficulties of transport and labor. The crushing plants of Marseilles had been authorized to export their produce without limit to England, and in limited quantities to Switzerland and Scandinavia, on condition of maintaining a stock, equal to the quantity exported, available for French agriculture. Soap-works shared the lot of the oil-mills. An important *stearinery* at Marseilles was producing to the limit of its capacity and employing 1,600 hands, but could not meet all demands upon it.

During the last months of 1915 oil-works, soap-works and stearineries were working at high pressure at Marseilles, less actively in other places, and there were complaints regarding the quality of the labour, the difficulty that soap-works were beginning to find in getting raw materials (potassium and sodium salts) and card-board boxes for expensive soaps, the high cost of haulage and of coal, etc. The stearineries, which were receiving private orders as well as orders from the army, were working day and night but could not cope with all the calls made upon them. They also supplied olein to the military authorities and enormous quantities of glycerine for the radiators of motor cars.

Gas-works, which had suffered much on the outbreak of hostilities from scarcity of labor and coal, had soon resumed their normal course. In 1915 they were impeded chiefly (1) by lack of coal and its high price; (2) by the lack of skilled workmen (plumbers, engineers, fitters); (3) by military events; in the Nord and in Paris they were obliged, as a result of air-raids, to reduce their output in conformity with the regulations restricting public and private lighting.

As regards *fertilizers* the situation was as follows. The output of *ammonia salts*, of which the most important is the sulphate of ammonia employed in agriculture, and which are principally obtained from the distillation of coal, amounted in France in 1913 to 75,000 tons, of which 22,300 tons came from gas-works. Imports were 21,827 tons and exports 1,733 tons. On the outbreak of war imports increased considerably, owing to the great demand by munition factories for sulphuric acid, which reduced the quantity available for the condensation of ammonia.

Of Chilean *nitrate of soda*, France had imported 322,000 tons in 1913 and exported 5,000 tons. Her consumption had accordingly been 317,000 tons. Of this quantity industry had utilized the following amounts:

Glass-making	2,000 tons
Manufacture of nitric and sulphuric acids, white lead and nitrites	20,000 tons
Saltpeter	6,000 tons
Explosives (average of pre-war years)	12,000 tons
<i>Total</i>	40,000 tons

Agriculture therefore consumed 277,000 tons; but war restricted this considerably, while industrial consumption greatly increased. The manufacture of munitions finally absorbed as much as 42,000 tons a month.

As to *superphosphates*, France alone before the war took one-sixth of the world output. In 1913 she produced in round figures 1,965,000 tons, imported 100,000 tons, and exported 145,000 tons. Her consumption amounted accordingly to 1,920,000 tons. But the war conditions brought production down to about 700,000 tons; for about 80 per cent of the output of sulphuric acid was reserved for munitions.

France produced before the war large quantities of *phosphate of lime*. The home production, it is true, was diminishing yearly, for pockets of rich phosphates (60 to 70 per cent) were becoming increasingly scarce. The output in 1913 was only 60,000 tons, and this was entirely retained in France. But the phosphates of Algeria and Tunisia are extremely rich and exceed French requirements. The world production, including that of South Africa, however, fell by 50 per cent in the two first years of the war, and French imports were considerably reduced.

The *manufacture of fertilizers* was severely affected by the outbreak of hostilities; orders fell off almost entirely, owing to the slackening of agricultural work. The situation changed in the first months of 1915; orders became plentiful, but factories could not execute them for lack of labor and especially of means of transport. Business continued very poor in the latter part of 1915, for the scarcity of chemicals and particularly of sulphuric acid began to make itself felt.

Manufactories of tannic extracts were very busy, as they were favored by the conditions of military contracts for the purchase of leather, which excluded hides tanned by mineral process. But they were soon hampered by the scarcity of male labor, which, in this industry, could not well be replaced by women, and by the difficulty of obtaining the chestnut wood that they required. None the less they remained extremely active during 1915. Many of them employed their reduced staff alternately on manufacture and on the work of felling and transporting chestnut wood. Nevertheless the supply of the latter was becoming increasingly difficult, and many

factories were obliged at the end of 1915 to close or to interrupt manufacture. In the Dijon area, *wood distilleries*, after a long period of dullness, showed recovery in connection with war orders (methylated spirit, and derivatives of wood distillation, aldehydes, formol, acetone, etc.).

Mineral oil refineries (see page 108), after having worked well at the outset and developed great activity, were soon impeded by difficulties of transport, from which they suffered much in 1915. Scarcity of labor was met, as far as possible, by the employment of women, but work in the refineries was often too trying for them.

There was acute depression in the *dye industry* after the mobilization, but a sharp recovery followed in the early part of 1915. Dye-stuffs were imported actively *through Switzerland* to meet the deficiency in the French supply. Among the German factories sequestered on the outbreak of war, two were in the invaded territory, two were requisitioned and manufactured explosives, and one manufactured dye-stuffs for French consumption under the control of the sequestrator. The dye factories of Creil, which had been set going again to meet the demand for explosives, were producing synthetic indigo. Among mineral colors, factories making ultramarine were reported to be busy, or at least to have many orders. Ocher factories, which produced mainly for export, were doing little work, in spite of many orders, owing to the difficulty of sea-transport. Pencil factories, especially in the Boulogne area, managed to keep running in spite of many obstacles (loss of skilled workmen, lack of aniline, high price of materials).

Although the *salt-works* of the Meurthe-et-Moselle had nearly all resumed work, they were not, in the early part of 1915, as busy as usual; orders were plentiful but fuel was scarce. The *soda-works* of the same district, which were started again at the end of 1914, were actively occupied in 1915, because part of their output was for defense purposes. At the end of 1915, a soda factory in the east, which was working indirectly for the military administration, was employing half its normal staff and was short of labor.

The total of articles of *perfumery* exported in 1913 may be estimated at a value of 60 million francs, against 35½ million francs of imports. French superiority manifested itself particularly in the export of natural perfumes (19 million francs of exports against

600,000 francs only of imports) and of essential oils (34½ millions of exports against 29 millions of imports). But France was heavily tributary to foreign countries for synthetic perfumes—81 tons from Germany and 22 tons from Switzerland out of 115 tons imported, against about 14 tons only exported.

There was a great development, on the outbreak of war, in the perfumery industry, except as regards luxury products; these were replaced by cheap articles, such as were provided before the war in large quantities by Germany. The gathering of flowers in the Alpes-Maritimes was however hampered in 1915 by lack of labor; and the supply of essence of lavender, which used formerly to be exported almost entirely to Germany, was purchased direct by America. The requisition of alcohol soon limited the development of this industry, the personnel engaged in which, toward the end of 1915, was nearly normal.

We now come to the years 1916-1918, when the chemical industries, under pressure of the needs of national defense, were working at their utmost capacity. Let us first see, as briefly as possible, how those factories fared which were more specially adapted to meet war requirements.

As regards these, the reports in the early months of 1916 speak of fresh increases of personnel, of additional and improved machinery, and of the opening or construction of new factories. There was a maximum production of sulphuric, nitric, and hydrochloric acids. The makers of fertilizers were producing acids for the manufacture of explosives, poison gas, and mustard gas. Plant for treating benzol was being added to coke-ovens, to gas-works, and to perfumery-works. New cotton-bleaching factories and liquid chlorine factories were started in many districts. A factory which for the previous year had only been making acetic acid and charcoal was now, thanks to the provisional exemption of a few specialists, able to produce formic acid, of which only a part was taken for military purposes. The manufacture of calcium carbide was also proceeding vigorously.

During 1916 this activity was still further increased. Numerous works were started, or reopened, or enlarged. Sulphuric acid factories furnished a significant example of this, as Table 44 will enable the reader to see.

TABLE 44

<i>District</i>	<i>Production in tons of sulphuric acid at 53° Baumé</i>	
	<i>1 July 1913 to 1 July 1914</i>	<i>1 July 1916 to 1 July 1917</i>
North	300,000	6,000
North-west	75,000	110,000
West	130,000	215,000
Centre	285,000	380,000
South-west	210,000	350,000
East	35,000	50,000
South and south-east	125,000	500,000
<i>Total</i>	1,160,000	1,611,000

The progress in the supply of pyrites, one of the raw materials of sulphuric acid, was as follows:

<i>Year</i>	<i>Production</i>	<i>Imports</i>
1915	195,749 tons	543,790 tons
1916	215,500 tons	777,700 tons
1917	268,646 tons	544,200 tons

Scarcity of freight had raised the price of pyrites from 25 to 65 francs.

Many manufacturers were producing chemicals that had hitherto been obtained from Germany, particularly compounds of baryta. For this purpose a company had bought certain deposits, hitherto undeveloped, of barium sulphate. New works were opened for the manufacture of bichromate of potash and of soda. There was a steady increase during 1916 in the output of carbolic acid, of phosgene, of chlorates of potash and soda, and of tartaric acid which was exported to Russia, America, and England. Normal conditions had been restored in the manufacture of soda, of carbonic acid, and, notwithstanding the dearth of bauxite and of fuel, of alumina. Oxygen factories were working at pressure mainly to provide gas for welding. The extraction of benzene and toluene from benzol was proceeding actively.

The activity increased even further in the last months of 1916, and the index of employment (119 at the end of the year) neared its culminating point. Needless to say that all manufactories of explosives, fireworks, acids, and poison gases were overwhelmed with

orders. The manufacture of products that used generally to come from Germany was reported to be progressing (pure acids, antimony pentasulphide, permanganate and salts of potash, ammonium alum, dinitronaphthaline, and the salts of thorium and cerium).

A hydrogen factory, thanks to a new process, was able to supply large quantities to military aviation (Lyons). New works were started for the preparation of acetate of cellulose (a varnish for aeroplane fabrics) and of chlorate of soda.

But a wood distillery producing acetate of soda for the State was running only six furnaces out of twelve for lack of wood and labor. The soda factories working for munitions would have had a larger output if they could have found hands. Manufacturers of bitartrate of potash experienced a disquieting fall of prices owing to the diminishing demand from England.

During 1917 all chemical works were extraordinarily busy. The increase of output was specially noticeable in those concerned with war chemical material; it was here that initiative was particularly shown in ousting the Germans from the predominant position that they had acquired. In many places post-war policy was influencing plans for the immediate future.

Factories were being further enlarged, improved, or built, for the production of carbolic acid, melinite, liquid chlorine, oxalic acid, soda, bisulphite of soda, chloride of lime, formol, dinitronaphthaline; there was great activity in the manufacture of explosives, acids, and chlorate of potash, and in cotton-bleaching factories. An extension of electro-chemical works was reported, also the formation in the south of an important industrial syndicate for the production of nitrogen, cyanamide, and calcium carbide.

The development of welding had given rise to special activity in the manufacture of calcium carbide and oxygen. One of the factories so occupied was conserving nitrogen in order to sell it to rubber works. Another factory producing organic chemical materials, and normally employing 165 men, had in the first half of 1917 a staff of 358 employed on the manufacture of poison gas for the British army.

Factories making asphyxiating and smoke gases were still further extended as time went on. Works were set up to extract from old tin boxes the tin required for the manufacture of these gases.

The manufacture of products formerly supplied by Germany was pushed on vigorously: magnesium and its derivatives, permanganate of potash and antimony pentasulphide. Magnesium works (incendiary and illuminating materials obtained exclusively from Germany before the war) were developing.

But it was especially sulphuric acid factories that showed remarkable activity in 1917; all of them strove to increase their output and new works were started. One was reported as producing from the outset 150 tons a day, and as being capable of an output of 400 tons when the plant should be completed. Another factory, employing a process by which fuming sulphuric acid requiring no further concentration was produced direct, was to be extended to a fivefold capacity. It is to be noted that these sulphuric acid factories had to face a crisis in the supply of sulphurous pyrites, which was remedied by the increased import of Italian pyrites. During the last months of 1917 fresh factories were started. Nearly the whole of the output was assigned to the manufacture of munitions; the balance, unfortunately very inadequate to the needs of agriculture, went to the production of superphosphates. In certain districts the manufacture of the acid was entirely carried out by mobilized men, while its general handling was done by prisoners of war. Nevertheless dearth of labor and occasionally of raw material was hampering the development of certain factories. One, whose output was requisitioned by the Explosives Service, complained that it could only operate one-half of its burners, for lack of four or five workmen, and that as a consequence its monthly output was reduced by half. Another, which had undertaken to double its output of acid and superphosphate, was unable to complete the necessary installation, from lack of materials and workmen.

We must note certain checks suffered by chemical works during 1917. For instance manufacturers of soda received enormous orders in that year. But in the south-west, in order to get power, they had to burn wood from the Landes as fuel, which involved heavy expense; and the difficulty of dispatching their produce caused congestion and reduced their profits.

In wood distilleries, the output of which was intended for munitions, work was abundant but hampered by scarcity of coal. Similarly a manufactory of sodium acetate and certain bituminous schist

works were obliged to lie idle for lack of coal. Much difficulty in obtaining labor was experienced in some manufactories of potassium bitartrate; the labor had to be of a vigorous type; women were employed for the less arduous tasks, but men were lacking for the heavy work. Oxygen factories were short of cylinders; sulphate of ammonia and alum factories, of labor and of acid. The staff of a cheddite¹ factory had to be much reduced for lack of orders.

At the end of 1917, while the distribution of coal improved perceptibly, the railway transport position became worse, and there was some irregularity in consequence in the supply of raw materials. Sea-transport for conveying finished products to England, on the other hand, was fairly easy.

During 1918 and until the Armistice, the same causes led to the persistence of activity in the chemical industries. We may note a few points that have a bearing on the future. Electro-chemical factories producing calcic cyanamide, magnesium, caustic soda, and phosphorus, were extending and working without respite. As the utilization of water-power was becoming daily more prevalent, the correspondingly increased use of electricity as direct manufacturing agent led to a growing production of electrodes. An important chemical factory was developing the extraction of chlorides of magnesium and potassium, and of magnesium sulphate from the mother-liquor of salt-pans. It had improved its processes so as to increase its output after the war and was preparing to manufacture bromine on a large scale. A manufactory of dyeing and bleaching substances had supplemented its habitual production of phosphate and silicate of soda and of hydrogen peroxide by that of substances previously obtained from Germany: hydrochloric acid, pure ammonia, rectified sulphuric acid. It was also setting up apparatus for the production of baryta, barium carbonate, and sulphide of sodium.

The manufacture of sulphuric acid continued very actively in 1918, although the demand from the explosives factories had perceptibly diminished. The output of superphosphates would have been greater if factories had received sufficient quantities of phosphates. A manufactory of liquid oxygen had extended its plant, but sales fell off by 5,000 cubic meters a month; and by the end of the first half of the year it was idle three days a week.

¹ Cheddite; a French explosive. [Translator's note.]

Various obstacles were encountered in 1918 by the industry. Two manufactories of pierates had to discharge 1,100 hands owing to the dearth of nitrate of soda; certain tar distilleries working for munitions had trouble in obtaining their raw material, and delivered earbolic acid, naphthaline, and other products with difficulty. An oxalic acid factory, which was replacing German supplies, had to stop work owing to obstacles in connection with transport. A factory producing methylic alcohol and acetic acids could not get the supply of wood it needed. Finally, the necessity of reserving output to meet military requirements made it extremely difficult to supply civilian customers with certain things they needed; these had great trouble in procuring sulphuric acid, nitric acid, and sodium bisulphate.

With the above factories working almost exclusively for the army we may compare those producing pharmaceutical preparations and photographic paper, which, while serving many private customers, were mainly engaged in meeting military needs and received assistance accordingly.

During the second half of 1916, manufacturers of *pharmaceutical preparations* had taken the place of German makers on the home market, and were competing with them abroad. Their output was limited only by the shortage of alcohol, and here and there of labor. A few iodine factories lacked raw material (seaweed ash), but others were being extended. A factory that produced glycerophosphates, but had been closed since the outbreak of war, was reopened in view of the numerous orders. It produced 200 kilos of glycerophosphates daily for France and England and photographic developers derived from amidophenol. It was the only factory in France making this last article, and although it employed much female labor, it might have had a larger output if it could have found the personnel required.

At the end of 1916 the production of drugs was everywhere proceeding actively to supply military requirements. A factory making sulphate of quinine had doubled its output, and others had multiplied theirs tenfold, profiting by the disappearance of certain German articles. But the dearth of some kinds of raw material and especially of female labor made itself felt.

In 1917 the industry was prospering; this was notably so as

regards a large factory opened since the war in the Rhône (anti-pyrin, aspirin, etc.). Factories making certain 'special goods' were exporting largely, in particular to Brazil, in spite of the high cost of freight, and even to Russia, in spite of the difficulty of communication. The iodine industry was busy, and a new process for extracting iodine direct from green seaweed was in course of trial. On the other hand, a magnesium salts factory had to abandon the business for lack of raw material, and the same cause, coupled with scarcity of labor, imperiled a manufactory of borax and boracic acid, whose exports to England were reduced to a quarter of the pre-war figure. Finally the dearth of sugar brought about the temporary stoppage of a factory comprising the production on a large scale of pastilles and sweetmeats. At the end of 1917 the position of the industry was somewhat less favorable, and a slight depression occurred, owing to the lack of sugar, of skilled workmen, and of means of transport; but conditions remained good in certain districts.

The end of the war found the drug factories in excellent posture and their business growing. A laboratory was being established in the Tarn for pharmaceutical and industrial experiments on the employment of certain vegetable substances that abound in the district. It was hoped to produce such special articles as sparteine (extracted from broom), digitalin, cholicine (from autumn crocus) and ether tannin (from oak-galls), formerly imported from Germany.

In 1916 the output of photographic paper, freed from German competition, notably in America, reached and exceeded that of the period immediately preceding the war. The industry remained busy until the end of the year, but supply could not equal demand. The manufacture of photographic developers was likewise very satisfactory, but that of plates was hindered by the lack of skilled labor.

In 1917 several manufacturers of photographic plates, paper, and materials enlarged their premises to meet the requirements both of the public and of the photographic section of the army. Some of them were obliged to purchase the glass for plates, which they could no longer procure in France, at a high price in Switzerland; others, on the contrary, escaped the necessity of obtaining various chemicals abroad by producing them themselves or by getting them from

the State. At the end of 1917 the opening of new works was reported, designed to meet the needs of the army; but certain firms were complaining of the difficulty of transport, which hindered export to Italy.

In 1918 and until the end of the war, this class of factories had abundant employment; new ones were started but the supply of raw paper was short in some instances. A factory supplying the Health Department was exporting regularly to Italy.

By the side of the factories supplying exclusively or principally the army, there were those which worked principally for private customers. These too were generally prosperous during the period 1916-1918, but they had a hard struggle, as they received no assistance but on the contrary were frequently embarrassed by requisitions and prohibitions of export. There was no clear distinction, however, between the two classes of factories; it was in many cases a question of degree and appreciation. A factor contributing to the prosperity of the industry was the disappearance of German competition in a sphere where it previously held, so to speak, a commercial monopoly.

The *aniline dye* industry, which had been almost entirely in German hands before the war, developed in France from 1916 onward, although export was prohibited. The opening of new works allowed of a considerable increase of output. At the end of the first six months of 1916 a factory was obliged to refuse orders, owing to shortage of skilled labor and raw material. At the end of the year, notwithstanding checks, the industry was progressing more and more rapidly and new factories were being established. One of them undertook the preparation of dyes for leather (hitherto supplied by Germany).

As regards natural colors, an ocher factory was reopened in 1916. Output remained below normal because constructional work was stopped and export difficult, especially to South American customers. Toward the end of the year there were complaints of lack of workmen to extract, wash, and grind the ocher, and of barrels for packing. Producers of anti-fouling paints had plenty of orders during 1916 but were hampered by scarcity of raw material; their business improved at the end of the year. One of them constructed a new type of oven, for roasting the residues of the treatment of

copper pyrites. During 1917 and 1918 the situation remained favorable for the industry as a whole, though a slackening resulted at the end of 1917 from the fact that the Commissariat had appropriated raw materials and made them scarce. The dye industry of Lyons was developing extensively; its success was of great consequence to the silk factories, which before the war paid under this head a heavy tribute to Germany. Lyons by 1918 was producing all the dye-stuffs and other materials required by its dye-works and procuring only a few supplementary articles from allied or neutral countries. The manufacture of ocher, though orders were plentiful, was still in difficulties: the product was cumbersome, and means of transport inadequate. To obviate these difficulties manufacturers in the Vaucluse had recourse to a service of carts as far as the Rhône, and then to barges down to Marseilles. Makers of ultramarine were working normally, and likewise a white lead factory. Paint grinders, whose output went to the army, were especially busy.

In 1916 an important *pencil factory* might have tripled its output and exported, but it was short of staff, notably of machinists, and the makers of machine-tools for the manufacture of pencils could deliver nothing. As machine-tools became available, men could be replaced by women and export was resumed. But there was keen competition from Japan, Spain, England, and the United States. In 1917 the production was hampered by lack of materials: charcoal, pigments, graphite, and cedar-wood. In 1918 the industry was working satisfactorily but a supply of hard-wood from overseas was difficult to obtain, French wood being too soft. A new manufacture, that of copying pencils, was undertaken with success.

At the beginning of 1916 the manufacture of *artificial silk* was proceeding actively in the Ardèche; a factory was reported to have increased its staff by one-third and to be employing 200 hands; another, which was in the experimental stage at the time of the mobilization, had been able to start work during 1916 and was employing 150 persons. Women were largely engaged in the industry, which continued to do well until the end of the war.

The position of *gas-works* remained satisfactory during 1916, in spite of shortage of labor, particularly of skilled men, and above all of fuel; there were stoppages on the latter account in the Nantes

and Nancy districts. But at Marseilles two batteries of continuous furnaces with vertical retorts were inaugurated, marking a decided progress. The Marseilles gas-works were supplying metallurgical coke. The materials for purifying gas previously obtained from Germany were replaced by a mixture which gave satisfaction.

At the end of 1916 stoppages of gas-works were reported, lasting as long as 40 days, owing to dearth of coal; in other places the supply was shut off during several hours each day. These checks reacted rather seriously on the industries dependent on the supply of gas, many of which were employed on munitions work. Tar distilleries were active: a new one had just been started, and likewise a coke-oven for metallurgical coke.

At the beginning of 1917, owing to scarcity of coal, gas-works were producing more or less regularly only in the large towns. Everywhere else there were serious restrictions, and the small local industries dependent on the gasometers were gravely inconvenienced. Certain gas-works were distilling wood or peat. Many had obviated the lack of labor by engaging women and even children, and also labor from Kabylia, for the handling and sorting of coke. The tar distilleries and the factories treating carbolic acid for the Explosives Service had received from the latter the staff and raw material they required.

At the end of the war the situation did not much improve and consumers of gas were still asked to put up with serious restrictions. The premises of gas-works were encumbered with by-products and the small trades dependent on the supply of gas were frequently interrupted in their work.

The production of *ammonia salts*, in spite of the contribution of the coke-ovens, had diminished considerably, as appears from the following table, in which the output of 1913 is compared with that of 1917.

	1913 tons	1917 tons
Coke-ovens	37,500	9,300
Gas-works	22,800	19,200
Sewage works	12,200	5,500
Various	3,000	500
<i>Total</i>	75,000	34,500

There was thus a falling off of more than half in the output. On the other hand the need for sulphate of ammonia had caused imports to rise from 32,827 tons in 1915 to 71,226 tons in 1916 and 105,395 tons in 1917.

Oil-mills were very busy throughout 1916. The consumption of lubricating oil and oil for tempering compensated the poor sale of edible oil due to a bad vegetable crop. The restrictions on the export of oil-cake and the dearth of freight led to a congestion of this product.

The Marseilles *soap-works* were busy at the beginning of 1916, in spite of the enormous increase in the price of soap, but they slackened in the course of the year. The engagement of skilled hands in the Toulouse area allowed the resumption of the export of hard soap to England and America. But potash for soft soaps was scarce, and the output of soda lye was reduced by half. Finally, the prohibition on the export of glycerine was a cause of serious inconvenience to manufacturers, who were unable in consequence to dispose of this valuable by-product. It likewise imperiled the future of the *stearine* industry, which was suffering from other troubles as well. It was short of tallow, which it tried to replace by palm-oil. Its exports to Africa were reduced to *nil*, and to the West Indies by 50 or 60 per cent. However an important stearinery at Marseilles was still employing 2,000 hands and supplying candles, glycerine, oleine, etc., to the State and to the public.

At the end of 1916 oil-mills and soap-works were operating normally and they had partially remedied the serious deficiency of labor by engaging Spanish workmen; but business was conducted under difficulties. Ships were too scarce and freight too high for the conveyance of oil-seed. Restrictions on the export of oil and oil-cake, and, as regards the interior of the country where demand was keen, the railway crisis, were paralyzing the dispatch of goods. The stores were encumbered with stocks of soap. However soap-works making toilet soap remained very busy; they employed female labor.

In the early part of 1917 the interdependent industries of oil, soap, and stearine were all less active. Mills were short of skilled labor and it had become impossible to repair machinery; for these reasons a mill that used to crush 25,000 tons could now hardly deal

with 15,000. They were short of coal and no raw material arrived from overseas. There was still difficulty in getting rid of oil-cake. All these impediments caused an enormous rise in the price of oil. The scarcity naturally led to prohibition of export, and this very prohibition was a source of embarrassment. Olive oil alone, after a very good crop, was doing well toward the end of the year. The position of soap-works was no better; ships were bringing no palm-oil or colza-oil; tallow had risen from 70 francs to 325 francs the 100 kilos; as French soda was reserved for munitions, soda was imported from America at 124 francs the 100 kilos instead of 20 francs. As saponification requires steam at high pressure which wood fuel could not supply, the lack of coal was here particularly embarrassing. English competition was also complained of. At the end of the year the position was indifferent or bad in many districts. Still, in the Toulouse area work continued normally and the construction of new works was reported. Candle factories had numerous orders in 1917, but were short of labor, machinery, and coal. At the end of the year, in spite of all these difficulties, they were working satisfactorily, as were stearineries. A new tallow factory was in course of construction.

The same difficulties persisted during the first half of 1918. In the south-east the oil-seed syndicate was distributing seed to the factories; this stopped speculation but did not secure adequate supplies. Some factories were idle. Olive-oil factories however continued to do good business, although the retail price of olive oil was 7 francs the kilo. An endeavor was made to import from Sénégal ground-nuts already husked, to reduce freight, as the latter cost 700 francs a ton; but this entailed the idleness of sifting and husking works in France. Nut-butter factories, which had numerous orders, were short of palm-oil and copra, and had to reduce their output. Manufactories of oleic acid and of glycerine were in full activity in 1918; one of them had developed a process of treating oil with hydrogen which enabled it to supply lubricating oil to the military Air Service.

Soap-works had the same difficulties to encounter in 1918. Fatty substances of indifferent value were employed even in the manufacture of superior soaps. Hard soap was being produced containing 42 per cent of fats, and this, put on the market under the name of

'Marseilles soap,' imperiled the credit of an ancient and honorable industry. English competition made itself severely felt, but the great soap-works of the Toulouse area were still working well and with a full staff.

Although certain stearinerie and candle manufactories were suffering in 1918 from lack of stearine and of labor, others had a large output, and one had just installed new machinery capable, at a favorable moment, of intensive production. An inspector reported the success of an attempt to extract wool-oil without heat, in factories where the skin wool is removed from the sheepskins.

Tannic extract factories were very fully occupied in 1916. A few closed temporarily for lack of wood. Those of the Basses-Pyrénées were hindered in disposing of their products by export prohibitions, but those of the Savoy were exporting to England and Italy, where their tannin replaced that of Germany. The factories had abundant orders from the French and British tanners who supplied the armies, and their total output was about two-thirds of the normal. Men were replaced by women even for the heavy work, such as drying the wood, filling the retorts, casking, etc. The factories were making good the lack of coal by using waste and residues of chestnut wood. The position remained favorable in the first half of 1917 in spite of the difficulty of procuring chestnut wood (high price, lack of transport, scarcity of woodmen). One factory met the dearth of barrels for conveyance of the liquid extract by manufacturing dry extract which could be sent in sacks. During 1918 factories continued to work fairly actively, notwithstanding the same impediments.

The production of *chemical fertilizers* remained below the average in 1916 because each factory might use for the manufacture of fertilizers only a quarter of the output of its vitriol chambers. For this reason superphosphate factories, which were also hampered by the great difficulty of importing phosphates from North Africa, were working little and were unable to satisfy their customers. The price of superphosphates rose correspondingly: July 1914, 5 frs. 35; February 1915, 6 frs. 60; August 1915, 9 francs; February 1916, 10 frs. 25; September, 13 francs.

During 1917 the situation remained unaltered and the output of superphosphates was very limited—one-sixth of the normal in many

large factories. The agricultural demand could not be met, to the detriment of the crops. At the end of 1917, a certain improvement was reported, and an endeavor was made to satisfy the urgent need of agriculture. A battery of 36 ovens for pyrites started work at Rouen. In Brittany and elsewhere the Explosives Service released a rather larger quantity of sulphuric acid, of which the production was increasing. But the improvement was inadequate. There was no change in 1918.

The manufacture of *organic manures* was pushed on in order to make good the insufficiency of superphosphates. Viticulturists at the end of 1916 sought to compensate the scarcity of labor by extra manuring, but difficulty of transport made it impossible to meet more than a quarter of the demand. However, from March 1917, a suitable priority having been assigned to the transport of these manures, the factories, which had already been provided with Spanish labor, became more active. A bone-grinding factory established in 1915 took up the production of fertilizers, caustic potash, and soap. There was an increase in the personnel employed. During 1918 manufacturers sought to make good the deficiency of natural nitrates and phosphates by means of organic products, and produced some useful composts. Activity in the industry was satisfactory. A factory took up the treatment of bones with sodium bisulphate and sodium pyrosulphate and produced bone superphosphate for agriculture. Another set up a bone-grinding plant.

From 1916 onward manufactories of *sulphate of copper* and other chemical products for the treatment of vines and of wine were doing very well, notwithstanding an increase of prices of as much as 200 per cent. A factory in the Marseilles area increased its premises with a view to producing 60 tons of sulphate of copper a day, in place of 23. At the end of 1916 the output of factories reached four-fifths of the normal.

In 1917 makers of copper washes and cupric tale were increasing output, although the scarcity of sulphate of copper was felt at times. New works were established at the end of the year in view of the great demand. But a manufacturer who converted materials that had been used for purifying illuminating gas into antiseptic agents reported that he could no longer procure these materials, as they were requisitioned for the production of poison gas. In 1918

the manufacture of sulphate of copper was maintained vigorously; the new works could not satisfy the numerous orders induced by the high profits on vine cultivation. The makers of copper washes were equally busy and could not get the raw material and labor required to meet the heavy demand.

Sulphur-refineries were well occupied during 1916, and even approached normal conditions, employing Spanish labor. They were producing the sublimated and ground sulphur required for viticulture. But their activity was shortly restricted by the reduced supply of raw sulphur from Sicily, where labor was short. In 1917 the situation was uneven, depending on the supply of raw material; some factories were importing it from Texas. The output, as a whole, was half the normal, and prices were five times those ruling before the war. The situation remained, until the Armistice, dependent on the supply of raw sulphur. There was however some improvement in 1918 and the refineries of the Marseilles and Toulouse areas were very busy, as also the makers of sulphur wicks for viticulturists.

Petroleum-refineries employed large numbers of women in 1916, but consignments were delayed by lack of skilled workmen. Since the mobilization these refineries had ceased to be anything more than 'entrepôts' for marketable goods, confining themselves to handling American oil, of which the supply was at times impeded. Some were equipped with plant for extreme refining and produced special aviation petrol; but they were sometimes short of labor, coal, and railway wagons.

Manufactories of *coal briquettes* worked with difficulty in 1916 and 1917; supplies coming by sea or land were irregular; and labor, especially skilled labor, was short when raw materials were abundant. The whole output was taken up by the railways. The opening of a new factory was however reported at the end of 1917. In 1918 arrivals of coal were more regular, but there was an increased shortage of labor.

The manufacture of *resinous products* was almost *nil* in 1916, and very slight in 1917, because the price of the raw material was very high, and makers hesitated to buy, fearing a fall in the sale price during the period of manufacture. On the other hand the raw material itself was very scarce; the Commissariat had requisitioned

the distilling plants; the periodical cutting of wood in the Landes was difficult to organize owing to lack of skilled labor, while the wholesale felling which had been carried out to meet war needs had been detrimental to the future yield.

The *sea-salt* industry was fully occupied in 1917 and large orders were received; but the output remained short in 1917 and 1918, although an attempt had been made to remedy the deficiency of labor by the extensive employment of prisoners of war.

A *glue-factory* had made excellent progress; it was utilizing parings of hides from the local tanneries and was able to export to America and England. In 1918 manufactories of bone-glue and of gelatine were developing. At the close of the war, some firms were increasing their personnel, and the production of gelatine for photographic films, freed from German competition, was in full swing.

The *perfume-factories* of the Grasse region were increasingly busy about the middle of 1916, notwithstanding the difficulty of procuring supplies of alcohol and flowers; almost their whole output was exported to America, Sweden, Norway, and Russia. They were also selling cheap qualities of scent, which replaced German goods. But there was some relaxation in the course of the year owing to the fact that Italy prohibited the export of hogs' lard and of certain essences, and that the usual contingent of women had not been sent to Golfe Juan and Vallauris to pick the orange-blossoms, with the result that the quantity gathered was short by a fifth. The harvest of rose-petals was about 65 to 70 per cent of the yearly average. Some manufacturers undertook the production of artificial scents, hitherto a German industry; but they needed for this purpose certain raw materials requisitioned for munitions and therefore difficult to procure (sulphuric and nitric acid, etc.). Until the end of 1916 the perfumery industry continued in a flourishing condition, a matter of much importance, as two-thirds of its output was exported.

At the beginning of 1917, in spite of the dearth of alcohol and glass bottles, certain firms that were particularly successful in the sale of cheap articles were doing more business than before the war. But the figures of exports were less gratifying, because Italy, Spain, and England had prohibited the import of perfumery. The manufacture of synthetic scents was making good progress, although the

lack of raw material had, in certain areas, brought work to a standstill. There was great prosperity in the industry at the end of the year, because raw material was more easily procurable, and alcohol arrived with greater regularity from Spain. But bottles and cardboard boxes continued scarce.

In 1918 and until the end of the war, the demand for scents and essences far exceeded the production, although this had doubled during the war. The home demand had further increased since the arrival of the American troops. The industry employed a numerous personnel, composed of girls of 14 to 16. The dispatch of consignments was difficult and stocks were accumulating in some of the factories.

The chemical industries were completely upset by the Armistice, because war manufacture ceased: new factories created during the war and for the purposes of the war showed, in consequence of this specialized character, some hesitation as to the line of production they should definitely adopt; while older factories had to modify and sometimes renew their machinery, which was worn out by its unremitting employment.

A few works closed in the early months of 1919 (cotton-bleaching, cyanamide, chlorate of soda, etc.), but others were already striking out new lines. Many were undertaking the production of pharmaceutical and photographic materials, and of dye-stuffs hitherto supplied by Germany. A gas factory began the manufacture on a large scale of permanganate of potash, to utilize Alsatian potash. Makers of fireworks resumed their former work and set about producing anti-hail rockets.

In some districts the manufacture of liquid chlorine by electrolysis ceased entirely at the end of 1918, and the factories resumed the production of chloride of lime and soda lye. Materials were abundant and stocks had even to be accumulated. Distilleries of bituminous schist had not yet resumed work; some of them, which had been closed for five years, were unable to restore their plant to working order and closed definitely.

At the end of June 1919, notwithstanding the upheaval caused by the Armistice and the unfavorable conditions of the moment, the heavy chemical industry was slightly busier than before the war.

Most of the factories had not been able to do otherwise than resume their former employment; but attempts at innovations were fairly numerous. A dynamite factory during this half-year had enlarged and organized its premises for the production of sulphuric and nitric acids. A superphosphate factory was producing more than two tons of phosphate of soda a day and setting up plant for the manufacture of phosphate of ammonia. A carbonate of soda factory was now making only caustic lye. Manufactories of chlorates were employing their available electric current to produce aluminium, cyanamide, and calcium carbide. Other factories were taking measures to supply arsenious acid, sulphides of sodium, barium, and calcium, sodium silicate and bisulphide, and soda crystals. They also produced dyes. Two sulphate of copper factories had to suspend work for lack of coal and copper filings; but in the Marseilles district manufactories of red lead and litharge were working at full capacity.

At the end of 1919 the activity of the chemical industries remained satisfactory as a whole, and the numbers employed in them still exceeded those of July 1914. Orders for explosives were plentiful, and several dynamite factories had resumed work. The manufacture of nitrogen and calcium carbide was developing. Some new works were reported for the manufacture of bichromate of soda, employed in the tanning of hides by chromium and formerly a German monopoly; also for that of sulphides of sodium and barium, and of chloracetic acid, a raw material for the production of dyes. The manufacture of ferro-silicon was being developed, an alloy which before the war came exclusively from the Central Empires. A factory that was completing its plant would be in a position to treat 20 tons of pyrites a day instead of three; another, which had been completely demolished during the war, was being rebuilt for the manufacture of sulphate of soda.

On the other hand, a few more works manufacturing nitrate of ammonia and explosives had closed. The electro-chemical industry was particularly affected; its output, as a whole, was reduced to a quarter of what it had been. There was ground for fearing that certain firms, which held a favorable position in the world market in respect of sodium, calcium, magnesium, and peroxide of sodium, would now, under the vigorous competition of England and Amer-

ica, be obliged to address themselves to other forms of manufacture or transfer their available electric power to other industries. Certain wood distilleries were so encumbered with the accumulation of charcoal that they had to stop production.

Manufactories of nitric and hydrochloric acid were working normally, employing slightly more personnel than before the war. But a factory that produced acetic, formic, and oxalic acids was forced to be idle for two months for lack of sulphuric acid and coke. The construction of a factory was reported, for the production of dye-stuffs on a large scale. The manufacture of aniline dyes was developing more or less everywhere. Chlorine production was normal. A chemical factory in the south was working well at the end of the year, but employing only 534 workmen in lieu of 1,000, and was forced by lack of fuel to suspend treating the mother-liquor of its salt-pans.

As regards *sulphuric acid* in particular, factories stopped or reduced production as soon as the Armistice was signed. They were requested to resume manufacture of superphosphates, for which agriculturists were impatiently waiting. Unfortunately the deficiency of means of transport prevented them from dispatching their products and from receiving raw material; many orders remained in abeyance, and the personnel, who could not be efficiently utilized, were only kept on to prevent unemployment.

The same conditions prevailed in 1919: scarcity of freight hindered the transport of phosphates from Algeria and Tunisia. A factory that used to deliver 60,000 tons of superphosphates before the war was partially idle, and employed its staff on repairs and the construction of mechanical burners. Though the labor supply had improved in certain districts, in others it was recruited with much difficulty; some factories were still employing more than 50 per cent of Chinese labor. However, a few factories continued in normal working in the Lyons and Dijon areas, and a new superphosphate factory was opened near Rouen. A firm that was developing its production of sulphuric, nitric, and hydrochloric acids to the utmost was itself utilizing the greater part of these in the manufacture of dynamite, but nevertheless had to reduce its staff considerably since it ceased producing war explosives.

The manufacture of *pharmaceutical preparations*, which had

been very prosperous in 1918, remained among the most active of the chemical industries after the Armistice, though hampered by the dearth of alcohol and turpentine. Manufacturers were installing new plants in order to produce enough to oust German products from the French markets and to compete with them abroad, especially in the East. In factories producing drugs, the labor crisis was averted, thanks to the demobilization and to the retention of the female staff, which was by now well trained; but there was a lack of sugar, of wheat, barley, and maize flours, and of fuel. At the end of 1919 orders were double those of 1913, and exports were increasing.

The reduction of orders from the army after the Armistice entailed a slackening of work in factories making *photographic articles*. During 1919 some of these factories did an excellent business and their exports grew. But the difficulty of obtaining photographic plates continued very great. One firm was obliged by foreign competition to abandon its export trade in cinematograph films. At the end of 1919 orders were very numerous despite English and American competition.

The position of *gas-works* remained precarious, because they were either short of coal or received only inferior qualities. Conditions were similar in manufactories of *briquettes*. This unfortunate state of things entailed restrictions in the consumption of gas everywhere during 1919. Certain towns were obliged to suspend all illumination and supplied gas only at meal-times. In small places the manufacture of gas stopped completely. The manufacture of briquettes was however resumed with regularity at the end of 1919. Anthracite briquette works of the Alpine region overflowed with activity.

After, as before, the Armistice, the position of *oil-mills* remained uneven. But while olive-oil mills had had a normal season, the olive crop having been good, the production of other oils was below the average owing to lack of raw material. Makers of nut-butter could procure only palm-kernels for the purpose, whose yield after refining was only 30 per cent as compared with 60 per cent obtained from copra. English manufacturers, well supplied with the latter, competed successfully with the French. Ground-nut crushers were complaining of the state of their machinery, whose upkeep had

been neglected during the war. Soap-works reported difficulty of transport, except in the Nantes area, where output was normal. At the end of 1919 there was an appreciable recovery both in oil-mills and soap-works.

The return of demobilized men provided labor for *stearinerics*, but tallow, fat, oil, and fuel were scarce. One firm had reduced its personnel from 2,500 to 1,000, and in the Lyons area makers of candles and tapers found their capacity of output reduced by 60 per cent. America, profiting by its favored position during the war, had developed its means of production and was offering stearine and candles at a price below that of the same articles at the French works.

At the end of 1919, stearinerics were again working normally. Machinery was being modified and the most recent chemical processes were being tried in order to compete with America and England. The position of tallow melters remained indifferent during 1919. Experiments in the recovery of wool-oil, which had been undertaken in various factories where skin wool was 'pulled' from the skins, were interrupted.

In *sulphur-refineries* there was complete recovery in the course of 1919, supplies becoming regular.

Petroleum-refineries continued at first to confine themselves to transporting and re-selling mineral oil as it arrived from its country of origin. The situation improved in the course of 1919; activity was greater than in 1914 and some extensions of premises were reported. More labor was employed than before the war.

The production of *sea-salt* continued energetically after the Armistice. A manufactory of chemicals was considerably enlarged in 1919 so as to treat the mother-liquor of its salt-pans and extract therefrom bromium and chloride of magnesium.

Tannin-factories were obliged to close or restrict their operations in some districts. But in general business continued good. Chestnut wood, which in certain areas was becoming increasingly scarce, was now advantageously replaced by quebracho wood from South America, thereby saving French forests from complete devastation.

The manufacture of *dye-stuffs* did not continue to develop after the Armistice as it had done in some of the preceding periods. Nevertheless great progress had been made. In 1913 French dyers

were consuming annually 9,000 tons of dyes, of a value of 25 to 30 million francs, of which half came from Germany. Of the balance, France produced, with her own resources, dyes to the value of three million francs, and the remainder with the assistance of subsidiary German companies. This situation had changed during the war. At the time of the Armistice the Lyons factories alone produced more dye-stuffs than all the French factories before the war. All dye factories were extending and new factories were in course of construction. Unfortunately this development was checked by the dearth of special machinery, and especially of intermediate compounds, which were formerly almost entirely imported from Germany, but which France was now endeavoring to produce in order to remedy this weak point.

In the Paris area aniline and indigo factories were busy during 1919. The other works of the south, which before the war exported half their output to Germany, Russia, and Roumania, had not resumed business with those countries and were producing only one-third of their pre-war quantities.

Makers of *chemical fertilizers* had numerous orders at the time of the Armistice and had available large quantities of sulphuric acid, which had become useless for war purposes; but other raw materials were still lacking. As already indicated, some of the superphosphate factories, whose supply of phosphates from Algeria and Tunisia and of pyrites from Spain was very irregular, could only avoid turning off their staff by employing it on occasional jobs. The position was very uneven during 1919. One factory was still, in the first half-year, employing only 200 hands against 360 in 1914; another was on the point of closing. Some firms were unable to deliver what they had in stock. In other districts, on the contrary, factories were reported as working normally, or very actively. A factory was started to treat fish refuse, another to make nitrogenous fertilizer. At the end of the year all these factories were overwhelmed with orders, farmers being incited by the high price of agricultural produce to employ chemical fertilizers. Factories in the devastated regions started again with 40 per cent of their pre-war personnel. Unfortunately shortage of railway-trucks and the worn condition of machinery reduced the output of some works to one-quarter of the normal.

We should refer to the great activity prevailing at the end of 1919 in the manufacture of calcium cyanamide, notwithstanding the distrust of this new fertilizer manifested by some farmers, a distrust that seemed likely to be dissipated by the introduction of granulated cyanamide. It may be mentioned in this connection that in the latter part of the war, from 1917 onward, in view of the danger of running short of Chilean nitrates, the establishment of large electro-chemical factories had been undertaken, and correspondingly important works for utilizing water-power had been carried out in order to extract nitrogen from the air. Plant had also been set up to manufacture cyanamide. As a matter of fact, these factories were not of much use for war purposes, for the import of nitrates did not cease, as had been feared; but electro-chemical work developed. We should also mention the production of nitrate of lime for agriculture, carried on so far as the formidable competition of Norway permitted.

The *perfumery* industry maintained after the Armistice the activity it had enjoyed throughout the war. Exports to England, America, Spain, and the Dutch Indies were less impeded and increased in volume. Labor was amply sufficient, and raw materials easier to procure. Although the parcel post service was very slow, and glass, porcelain, and cardboard difficult to obtain, yet factories were working at full capacity, especially in the Paris area, where the personnel employed was larger than in 1914.

Exports increased in 1919. A firm made preparations to produce all kinds of synthetic perfumes; another factory was set up on a large scale for the same purpose and with the hope of competing with the German industry.

We may say, finally, that in spite of the efforts made after the Armistice, the ambitious projects conceived in France during the war have not been entirely realized. There is still hesitation as to the use which should be made of the great factories erected by the State during hostilities. Many schemes have never got beyond the stage of preliminary study; others seem on the point of fruition. The French chemical industry, however, has made all the more rapid progress that the vast factories situated in the invaded zone have now been rebuilt; these today are adding their quota of capac-

ity to that of the new factories¹ of the Lyons area, of the west, and of the south; while France disposes in addition of the already existing factories of Alsace-Lorraine.

In order to show the evolution of the dye industry in France, Table 45 is reproduced from the *Revue Industrielle* of March 1923, with the figures for 1922 added.

TABLE 45
OUTPUT OF DYE-STUFFS IN TONS

	1913	1920	1921	1922
Germany	125,000	47,000	53,000	92,682
United States	3,300	28,000	17,700	29,000
Great Britain	2,000	26,000	7,000	9,300
Switzerland	8,000	12,500	6,000	6,300
France	1,000	7,350	5,850	8,068

It may be said finally that France is today in a position to withstand German competition in many spheres. A fuller study of the question is to be found in the special volume of this series on the Chemical Industry.

¹ The 'Compagnie Nationale des matières colorantes et produits chimiques' was founded on the 22nd January 1917 with a capital of 40 million francs. Its works occupy a large area near Creil and at Oissel, where the old explosives factory has been put at its disposal by the State for 18 years. It has absorbed another company and increased its capital to 100 millions. It has made a great effort to place on the market the many dye-stuffs it successfully produces; it also manufactures a large part of the intermediate compounds. It directs its attention to home consumption and not sufficiently to export. The whole of the factories producing dyes in France are valued at 170 million francs and their output should reach a value of 300 to 350 million francs. France consumes 240 million francs' worth of dyes, of which 73 per cent are already produced in the country.

CHAPTER IX

RUBBER, PAPER, CARDBOARD

IN this group of industries the index-numbers of the establishments at work and of the personnel employed, at the dates of the several inquiries, were as shown in Table 46 (French territory as reduced by invasion).

TABLE 46

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	46	33
Oct., 1914	58	42
Jan., 1915	70	53
July, 1915	80	62
Jan., 1916	84	69
July, 1916	88	74
Jan., 1917	88	72
July, 1917	90	78
Jan., 1918	90	79
July, 1918	93	76
Jan., 1919	90	72

The return for January 1920 relating to the entire French territory gave an index-number of 94 for establishments and 94 for personnel.

As regards *rubber*, the following figures indicate the position of the French industry. The world production of rubber in 1913 was 105,200 tons; of this total the French African colonies produced 4,950 tons (4.6 per cent), of which about half (2,400 tons) was imported into France. French consumption amounted to 5,950 tons. After 1913 the world production developed considerably:

in 1914 to 116,600 tons
in 1915 to 158,000 tons
in 1917 to 257,000 tons

Appendix XXVIII gives French imports and exports from 1913 to 1919. The difference between imports and exports in 1913 gives

French consumption in that year as 5,942 tons. It will be observed that French exports of raw rubber amounted in 1913 to about 66 per cent of the imports, so that there was a real rubber market in France. Further, that, as consumption (about 6,000 tons) exceeded colonial imports by 3,500 tons, the French rubber industry depended on foreign supplies for about two-thirds of its raw material.

French consumption of rubber largely increased during the war, as is evident from the following figures of the excess of imports over exports of raw rubber in the several years:

1913	5,942 tons	1917	16,880 tons
1914	4,447 tons	1918	14,441 tons
1915	9,647 tons	1919	17,970 tons
1916	12,989 tons		

The exports and imports of the principal manufactured rubber goods may be seen in Appendix XXVIII.

As regards *paper and cardboard* the following statistics relate to the year 1913.

I. *Raw Materials.*

Rags	French consumption	40,000 tons
Wood	{ French production	500,000 cu. meters
	{ Imports	500,000 cu. meters
French consumption		1,000,000 cu. meters
Pulp	{ French production	181,000 tons
	{ Imports 464,947 }	difference 464,000 tons
	{ Exports 652 }	
	French consumption	645,000 tons

II. *Paper Manufacture.*

French production	700,000 tons
Imports	17,917 tons
	<hr/>
	717,917 tons
Exports	45,208 tons
	<hr/>
Consumption	672,709 tons

As regards rags and pulp, the quantities that the paper industry had at its disposal during the war, beyond those produced at home, were as follows:

1913	534,437 tons	1917	135,307 tons
1915	267,964 tons	1918	264,794 tons
1916	364,683 tons	1919	238,946 tons

The resulting lack of raw material led to the scarcity and high price of paper.

We shall first give a brief summary of the vicissitudes of the rubber, paper, and cardboard industries during the first months of the war and until the end of 1915. We shall then take each of the three industries separately and examine its position down to the post-war period.

On the outbreak of hostilities these industries, like the rest, were brought to a partial standstill. Nevertheless activity was maintained in works where paper and cardboard were cut out (for envelopes, postcards, etc.), and in those which in pre-war days were already employing chiefly women and children.

By January 1915 there were signs of a marked recovery, and this became more pronounced. But firms producing luxury or fancy articles were in jeopardy for lack of orders; mills making art paper for cards and albums were idle; at Nantes a large manufactory of luxury articles was employing only 180 hands out of 450, and one machine out of four. The reports also mention that the comb factories at Oyonnax were threatened by the lack of the nitric acid necessary to the manufacture of celluloid.

Works, on the contrary, that were supplying needs arising out of, or stimulated by, the war, were developing greatly. Rubber factories at Marseilles were very busy. The ebonite works of Saint Claude were employing more hands than in 1914. Note-paper factories were actively occupied, for there had been a great deal of correspondence by letter since the mobilization. Some paper-mills in the Vosges were reopening. Cigarette-paper manufacturers were also active, for the army demand was very large; so also were makers of "news" paper, of packing paper, of tough paper for cartridge works, and of fine paper for the geographical service of the army.

Paper-mills were however hindered by the shortage of labor, by the high price of raw material (the supply of Swedish pulp, and of wood from Finland and Russia, had ceased), and by the lack of certain chemicals, such as sulphate of alumina and chloride of lime, which had to be imported from America. A normal output was impossible. The wood-pulp and cellulose factories that supplied the paper-mills regulated their production according to the requirements of the latter.

The cardboard protecting wrappers for fuses were made without difficulty by women and children. The factories producing them were doing well and could not cope with their orders.

We will now consider the condition of the three sub-groups separately, from 1916 until after the war, beginning with rubber.

During 1916 the activity of *rubber* works constantly increased, for they were receiving orders for military purposes in addition to orders from the trade. They were largely employing female labor, and in spite of lack of chemicals they went on developing, supplying waterproof clothing and boots, gas-masks, surgical goods, and pneumatic tires. In the Limoges area, the personnel of a factory rose from 979 to 2,574, nearly the pre-war figure. Another which employed 1,917 hands (of whom 726 were women) in July 1914, now had 2,010 hands, of whom 1,103 were women.

Some factories were also producing vulcanite articles: tanks for accumulators and batteries, insulators for telegraphy, telephony, and wireless telegraphy, the use of which had progressed enormously. These articles, which were formerly supplied by Germany, were now obtained solely from French manufacturers. Among others, the rubber and ebonite factory of Saint Claude, in the Jura, producing mouthpieces for pipes, surgical implements, aircraft fittings, etc., was developing in a remarkable manner: its personnel, which numbered 118 before the war, increased to 313 in April 1916, 338 in July 1916, and 388 at the end of that year.

The rubber industry continued to flourish till the end of the war. Although some factories were hampered by shortage of coal or of electric power, or by difficulties of supply, the personnel employed increased in numbers, one firm employing successfully some scores of Annanites and Tonkinese. As production for civilian customers

was very restricted, while that for the army was very active, facilities were provided for the factories working for the latter. Stylographic pens made of vulcanite, hitherto exclusively supplied by Germany, were manufactured in many towns.

On the termination of the war, orders from the military administration came to an end, but the factories were not left idle; they maintained their activity and their staff, some even increasing the latter and improving their machinery and output. The cycle and motor industries, which profited by a sharp revival, were absorbing large quantities of tires. The works that had supplied balloon fabric, hardened rubber, etc., for defense purposes, adapted themselves to the new requirements, producing waterproofed fabrics for clothing and boots, surgical apparatus, smokers' requisites, and toys. The greater part of the output of tires was purchased by Belgian, Dutch, and Spanish agents, sometimes for the German market.

The manufacture of celluloid continued to suffer in 1918 from the diversion of its raw materials to military uses. It almost ceased in the Lyons area, and the factories adapted themselves to the production of gun-cotton. After the Armistice they successfully resumed their normal business, and no longer had to meet Japanese and American competition.

Paper. Certain paper-mills remained well occupied during 1916, thanks in a measure to military requirements; this was so, for instance, as regards *cigarette-paper* factories. These factories were producing also for export and did not suffer from scarcity of labor, as they employed only women. An Angoulême firm increased its output by 25 per cent, and the most important cigarette-paper factory in Paris was producing as much as before the war. *Note-paper* factories were doing equally well, and manufacture was limited only by lack of machinery.

Other paper-mills encountered increasing difficulties, of which the principal was the almost total absence of raw material. In this respect French paper-mills were unfortunately situated even before the war. The supply of rags and waste paper was inadequate to requirements; rags moreover were also used by other industries, and their export was developing, so that wood and pulp constituted the most important source of raw material. But although France

is a well-wooded country, comprising $16\frac{1}{4}$ million acres of forest, or one-sixth of the total area, the quality of her timber is not well suited to paper-making. She was therefore importing wood in 1913 in large quantities, and also mechanical and chemical pulp. The more the manufacture of paper increased, the greater was the dependence of the industry on foreign markets. A serious crisis was bound to arise, and the war hastened its advent by reducing the imports of raw material.

The crisis became very acute early in 1916, and many works had to close. Whereas the industry had 622 machines at work in 1914 (distributed among 354 firms), there were only 374 running in February 1916. The total daily output, including that of the prosperous branches of the industry, was 1,000 tons against about 2,100 tons in 1914. Accessories were also lacking: felt, metal sheeting, colouring materials. At Bordeaux, the want of sulphuric acid caused a manufactory of sulphurized paper to suspend work, while paper of certain shades could not be made for lack of colouring materials. At Bordeaux likewise, a manufactory of straw-board had to reduce output by 40 per cent and then to close completely for three weeks, owing to the failure of the supply of straw. Paper-mills however remained busy at Rouen, at Toulouse (where Spanish labor was employed), at Lyons (where packing paper was made for shells), and in the Vosges.

During 1916 difficulties increased because the import of waste paper from England ceased, and because the rye straw of the Corrèze and Haute-Vienne departments, which formerly supplied the paper-mills, was requisitioned by the Food Department. The price of bleached cellulose was now five times as high as before the war, and that of sulphate of alumina six times. Acids and chloride of lime, the main supply of which went to the army, were available only subsidiarily for paper-making. A very slight accident to the machinery led to the temporary stoppage of whole factories, as the machinery required skilled handling. The best use possible however was made of female labor, and women were set to the winding, cutting, and washing machines and to the calenders. Trolleys and tackle enabled them to handle heavy weights.

The consumption of paper, especially of expensive qualities, wall-paper, and commercial wrapping paper, had had to be restricted

far more than would be inferred from the general figures of output given above.

In 1917 and 1918 the paper industry was subjected to the same trials as before. Raw materials, rags, waste paper, pulp, and coloring materials had enormously risen in price; it was impossible to procure alfa grass, chloride of lime, aniline sulphate, and certain articles whose export had been prohibited; metallic sheeting for continuous machines was scarce. The crisis in railway transport, which was very acute at the end of 1917, prevented the dispatch of the reels of manufactured paper, and these had to be stocked. Finally, the dearth of coal was particularly serious, in connection with the washing and steam-drying processes; the result of using alternative fuels was unsatisfactory. Many mills, as a result, reduced their personnel or worked short time.

Conditions nevertheless remained satisfactory, in 1918, in manufacturing of cigarette-paper and note-paper, and relatively so in the mills of the Ardèche, which produced mainly for export, and in those which supplied the great daily newspapers. Other mills were transformed, one for instance into an electro-metallurgical factory; others added to their ordinary work the unraveling and bleaching of cotton for explosives factories; others substituted French woods for Russian wood in their processes, or obtained cellulose by the successful treatment of reeds from Camargue; others again overcame the transport difficulty by organizing water transport and steam lorry services.

While the coal shortage was forcing many mills to reduce their work, those in the districts of the Dauphiné and the Pyrenees, by utilizing hydro-electric power, were extending their premises and increasing output.

Conditions after the Armistice varied greatly according to districts, to the facilities for obtaining supplies or dispatching goods, and to the ingenuity displayed by the manufacturers. Some mills restricted, while others increased, their output. There were instances of shortage of coal, of wood-pulp, of skilled labor, and of coloring materials; and manufacturers of straw-paper for packing showed apprehension of Italian and Dutch competition.

As regards the *cardboard* industries, the shortage of skilled labor made itself felt on the outbreak of hostilities; but women

managed to run the machinery (for bending, cupping, cutting, and punching out) and a certain number of provisional exemptions from military service were granted. A mill in the Aude substituted for its ordinary work the washing of cotton for explosives. Corrugated cardboard works at Bordeaux were obliged to close for lack of straw-board. But in general business remained good. Certain works turned their attention to the small folding boxes for confectionery or pharmaceutical goods with which Germany used to flood the French market.

The position of the cardboard industry, like that of paper, became difficult toward the end of 1916. Only makers of tar-board for hutments found it easy to procure raw materials. Most manufactories of corrugated cardboard, other than those working for the army, were closed. The price of cardboard had tripled, and the transport crisis had stopped exports. Nevertheless makers of cardboard for the shoe industry were fully employed in 1917.

The situation remained precarious in 1918. The mills, being freed from German competition, had numerous orders; but, except when working for the army, were not flourishing, owing to lack of raw materials.

After the Armistice, stagnation overtook the cardboard mills, for they at once felt the competition of cheap German products, and they were also affected by difficulties of transport. But there was some recovery in millboards; and makers of corrugated board were once more getting the straw-board they required. At the beginning of 1920 the recovery was still more pronounced, and was only limited by the difficulty of increasing the personnel and of procuring raw material.

CHAPTER X

PRINTING AND BINDING

IN this group the index-numbers of establishments at work and of personnel employed at the dates of the several enquiries were as shown in Table 47 (French territory as reduced by invasion).

TABLE 47

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	52	33
Oct., 1914	61	34
Jan., 1915	67	42
July, 1915	76	47
Jan., 1916	80	49
July, 1916	82	53
Jan., 1917	83	56
July, 1917	86	55
Jan., 1918	86	56
July, 1918	89	56
Jan., 1919	89	60

The returns of January 1920 relating to the entire French territory give the following index-numbers: establishments, 97; personnel, 66.

Thus, while the number of establishments at work had on the morrow of the mobilization diminished by half, the personnel employed had fallen approximately to one-third. And whereas the number of establishments at work had risen to 80 per cent as early as January 1916 and reached normal again in 1920, the personnel increased only slowly, and even after the war was barely two-thirds of the normal number (if we include the liberated districts in the calculation).

The short table in Appendix XXIX of the principal items of foreign trade connected with this industry (transit excluded) shows that both exports and imports perceptibly diminished (with the

exception of imports of newspapers in 1916 and 1917), an illustration of the severe depression experienced by the printing trade during the war.

We may point out to begin with that French imports of engravings, prints, and lithographs amounted in 1913 to 678 tons in weight, and to 16 million francs in value (or 23,676 francs the ton); exports of the same were 459 tons, valued at 11½ million francs (25,000 francs the ton). But declarations of value, particularly for exports, are not to be relied on, and the difference between the unit values must have been much greater. The French imports consisted mainly of cheap goods: picture postcards, chromos, and the like; whereas the exports comprised a larger proportion of works of art, engravings, etchings, etc. Of the cheap goods, Germany supplied 40 per cent, England 23 per cent. France's principal customers were Belgium (37 per cent) and Germany (17 per cent). She also exported many pictures, sculptures, and paintings.

During the war imports and exports of engravings diminished, but one is struck by the much more marked recovery of exports than of imports at the end of the war. Exports in 1919 were much larger than imports, and whereas exports reached 70 per cent of those of 1913, the corresponding proportion of imports was only 43 per cent. It is known moreover that although artists suffered to an exceptional degree from the war, the trade in works of art was resumed before hostilities ended. There were periodical exhibitions of a public or private character, and Paris remained, as in pre-war times, the great mart for artistic works.

We have seen in the previous chapter the indifferent situation in which France was placed, even before the war, in respect to the production of paper, and that this situation grew steadily worse during the war. A formidable rise ensued in the price of paper, and we shall now consider its reaction on publishers and booksellers. The position of the publishing business is of special interest because of its direct connection with literature, art, and science, in fact with the principal elements of our civilization.

The German book trade before the war unquestionably benefited by its methodical organization. The arrangement of trade agencies, bibliographies, and technical instruction was known to be more efficient in Leipzig than in Paris. Surprise used to be expressed at

the number of German editions of classical and even of French works. Facts and figures were quoted of disquieting significance for the future of the French book industry. The latter however held its own. If many foreigners learnt the French language in Leipzig publications and if French imports were large and increasing, it must on the other hand be remembered that French books radiated the world over and that the trade of France in printed matter showed a balance in her favor of 112 per cent (in 1913, 13,259 tons exported against 6,254 tons imported). She exported in particular, to Spanish America, a large number of books in the Spanish and Portuguese languages. Her imports consisted in great measure either of French books produced abroad under conditions more favorable than could be found in France; or of periodicals, mainly fashion papers produced in Germany and Austria. Before the war, more than sixty of these fashion papers, printed in French in the Central Empires, were regularly sent to Paris to acquire a certificate of origin, and were issued thence to all parts of the world to disseminate the alleged latest Paris fashions.

From the moment of the outbreak of hostilities, French publishing houses, except such as issued devotional books, had little to do. But the end of the war brought important consequences. The following is an extract from a report by M. Max Leclerc, a publisher, to the 'Congrès National du Livre,' 1921:

In 1917, when the last congress took place, conditions in the publishing trade had been affected by the war only to a slight degree as compared with what occurred in the following years. No doubt, we [publishing houses] had even then to struggle with the dearth of labor and raw materials, with difficulties of transport and reduced demand. But the full influence of these factors was not felt until the middle of 1918, when the submarine campaign had reduced to an extraordinary extent the world supply of raw material.

After the armistice, the situation almost immediately became easier; prices, which had increased by 400% since 1914 as regards paper, 600% as regards binding, fell rapidly to 250 and 300% respectively. But now a new factor intervened: consumption, which had been regulated and dammed up by war legislation, broke out and ran riot; after its long fast the public appetite had to be satisfied; and dealers and manufacturers, principally English and American, launched out into a publicity campaign in newspapers, periodicals, and catalogues, which

entailed an almost incredibly lavish expenditure of paper. Not satisfied with appropriating the greater part of the stock of paper and pulp from the left bank of the Rhine and the Baltic, English and American dealers came and swept off paper from France itself. As early as June 1919 there were signs of an approaching exhaustion of stocks; from that moment there was a fierce struggle for all raw materials of book production, and prices in a few months leapt to formidable heights, reaching, for paper, an increase of 1,000 to 1,300%, and for binding, of 680%, on the 1914 price.

In May 1919, the Eight Hours' Day Law, hastily voted and applied without the necessary transitional steps, upset the book industry at the very moment when it had to cope with a shortage of labor and of technical assistants. For printing and binding, which are not war industries and had with much difficulty kept themselves alive while war lasted, had been unable to offer anything approaching the rates of wages which the war industries had let loose over the country: no women were to be got as book-sewers or compositors—they all wanted to make shells; all the mechanical industries connected with the war exercised an intense attraction on such foremen-compositors and skilled operatives in paper factories as had not been mobilized. . . . The transport industries passed through an even more serious crisis, because traffic had increased in inverse proportion to the facilities available, entailing an appalling congestion of the ports and railroads. . . .

At the moment, therefore, after the Armistice, when they would have wished to make a vigorous effort to increase output, publishers found themselves seriously affected by the following troubles:

(1) Good quality paper was practically unprocurable; ordinary paper reached prices representing an increase of 1,000 or 1,300%, and during several months was almost entirely off the market; in accepting orders, manufacturers made it a condition that neither price nor time of delivery should be fixed.

(2) It had proved impossible to man the majority of the printing-presses, and there were not enough of them at work; the reduction of hours of labor, the demoralization which affected the whole staff, all these causes contributed to the same result, a slow, scanty, and expensive output.

(3) And when paper and printers had been discovered, it was impossible to secure that the paper should reach the press from the factory in anything like normal time; weeks and months would pass while the trucks wandered in the most unexpected places or were side-tracked

indefinitely—or totally disappeared, so that the whole process had to be begun afresh.

When finally the luckless editor succeeded in getting his rolls of paper as far as the printer's there would be a strike, or the press would be congested. Impossible to say whether the printing would be done in three weeks or three months; the printer either did not know himself, or would give no answer to the most pressing inquiries. . . .

What policy, in these conditions, did publishers adopt? The publication of classics supplies the most striking example, because, consumption having been less affected here than in other branches of the industry, publishers of such works were obliged to maintain output at any cost, and therefore were the first to find themselves confronted with the necessity, if they were to keep their heads above water, of modifying their prices.

The policy followed by the syndicate of publishers was as follows: they would consider, as costs gradually increased, the proportion by which sale prices should be raised, and decide this proportion as accurately as possible so as to apply it uniformly to all publications, whatever the date of their issue.

The Classical Section accordingly adopted a first temporary increase in sale prices of 10% in January 1916, although it had had to support during the whole of 1915 an increase in the price of paper, which had affected newly printed books, and of binding, which had affected not only new books, but also old books that had been kept in stock unbound.

This increase in sale prices was recognized as clearly inadequate, and was raised in May 1916 to 20%; and for 18 months publishers, from motives that do them credit,—the wish to keep the price of their books within the means of schools, municipalities and families—maintained the level of 20%, while they were supporting increases of 280% on paper, 150 to 200% on full cloth bindings, more than 100% on paper boards style, and 55% on printing.

In January 1918, in view of the uneasiness prevailing generally in the profession, and of the fact that cash receipts were inadequate to enable reprints or new works to be taken in hand, the Classical Section was driven to adopt a fresh increase, bringing the total to 70% above original prices.

This new level was maintained for a whole year (1918) while paper rose to 400% and paper boards binding to 200%; it then had again to be revised, and publishers agreed to raise prices by a further 30%, bringing them to only 100% over the pre-war rates. This last increase came into force on the 1st January 1919.

A few months later, about the spring of 1919, paper showed some tendency to fall, but on the other hand the cost of printing and of bindings continued to rise.

Nevertheless, publishers thought it might be possible to confine themselves to this last increase of 100%, for they hoped that they were moving, painfully no doubt, towards better times.

In this hope they were disappointed. There were disturbing factors in industry which brought about considerable increases of price in all commodities, a reduction of output, and a dearth of paper; and before long costs of all kinds leapt upwards. To maintain any longer the level of 100% meant inevitable disaster; steps had to be taken urgently; and without neglecting for an instant the consideration by which they had throughout been guided—the maintenance of literature as a high national interest—publishers felt compelled once more to raise their prices.

At this stage (February 1920) it became necessary to incorporate the increase now decided on as indispensable (170%) in the basic price, and to prepare a common catalogue of classical works on the basis of the new rates.

Less than three months later, as the position had been further aggravated by the constant rise in the cost of paper, binding, and printing, it became necessary again to raise prices, and an increase of 40% on the new prices of February 1920 was recognized as inevitable, not with a view to yielding profits, legitimate as these would have been, but to obviate the losses which were impending. Altogether, the 40% increase on the new catalogue prices involved an average increase of 278% on the pre-war rates, whereas costs of production had risen on an average by 600%. . . .

At a time when French publishers were paying 400 francs the 100 kilos for paper that in 1914 was invoiced at 42 francs . . . the Minister of Public Instruction, whose office had for several months past been mysteriously preparing a reformed curriculum for primary, secondary and normal schools, suddenly introduced this curriculum at the July session of the Superior Council of Education.

. . . In spite of the well-founded protests of the publishers of classical books, it was promulgated in September 1920 and put into force on the 1st October. By a stroke of the pen a very important part of the publishers' classical catalogue was demolished, and hundreds of thousands of expensive volumes became unsaleable; this material, which before 1917 represented in cost of setting up, illustration and stereotyping, several millions of francs, for hundreds of different works were

involved, and which would today cost five times as much to reproduce, —all this material was now only fit to be pulped. . . .

Today the publishers, who have had to digest the huge loss caused by the production of their books under the conditions imposed on them in 1920, and to face the vast expense entailed by the Minister's sudden reform, have nevertheless just decided to lower, from the 1st April 1921, by 40 to 25%, the catalogue prices that had ruled since the 1st May 1920, prices which had been fixed before it was known that the price of paper would rise to 900%.

Appendix XXX enables the reader to see at a glance and compare, at different periods of the war, the various factors in the printing industry that have been considered above. We may note a few further points of interest with regard to the position in which publishers were placed; here for instance are the changes that the war brought about in the publication of works of general literature, that is to say, of novels, history, poetry, and criticism.

In 1914, a volume of 20 signatures imposed in sixteens (or 320 pages), of which 2,000 copies were printed, could be produced at 0 fr. 73 the copy and sold at 3 frs. 50, which allowed a sufficient margin to cover the bookseller's discount, the author's royalty, the general expenses and a normal profit to the publisher. The sale of about 1,200 copies sufficed to pay the cost of production of the 2,000 copies printed.

If 5,000 copies were printed of the same book, each copy worked out at only 0 fr. 43, which allowed of an increased royalty to the author, of more publicity and of a respectable profit.

As a result of the cataclysm caused by the war, prices rose in the manner above described:

It followed that in 1921, the same book of 320 pages, of which 2,000 copies were printed, cost 2 frs. 96 the copy (that is to say 400% more than in 1914), and even if sold at a price increased by 100%, was no longer the same commercial proposition as the volume of 1914.

The sale of 2,000 copies of this book at the high price of 7 francs (less the bookseller's discount) will barely cover the cost of production and will not allow of the payment of a royalty to the author, nor meet the publisher's general expenses, and any profit is out of the question.

The imperative necessity of large issues in order to reduce the unit cost is what prevents the publisher from producing the works

of new authors, however interesting they may be, because they will not, like those of known writers, reach a minimum sale of 3,000 copies, below which the publication, under the economic conditions of the post-war period, is unprofitable.

It is the same with historical works, which before the war reflected as much credit on French literature as did the novel:

Issued generally, by reason of their length, in octavo volumes, they were priced 7 frs. 50 or 8 francs. Today (1921) they cannot be priced at less than 15, 16, 20 francs and even more. Many of these works, of an erudite character, appeal to only a limited public, so that only a small number can be printed. Their cost and consequently their sale price become therefore prohibitive. Historical works will have to wait for better days.

Labor Inspectors reported in 1918 that while the publishers who produced classical and scientific works were doing badly, the issue of books for the army zone was proceeding actively. Another point of interest for publishers was the reinstatement of French in 1919 as the language of Alsace-Lorraine; this afforded the publishers of classical works an opportunity for a vigorous effort, by which printers, binders, and book-sewers also profited largely.

If we now examine the *Printing* sub-group, we gather from the reports that it suffered from the effects of the war to perhaps a greater extent than any other industry. After the mobilization, one-half the printing-presses stopped work. But a distinction must be drawn: presses working for publishers stopped completely, and the stoppage was prolonged; among commercial presses, some were idle for a long time, others worked short hours with a reduced staff. Only newspaper presses were at once active. In Paris, newspapers of 8, 6, and 4 pages now appeared with only a single page, so that the staff, reduced by the mobilization, sufficed for the printing, while women did the folding. The great commercial establishments reduced their advertisements, and expensive catalogues, printed in colors, were done away with.

In the early months of 1915 the recovery was very slow in the provinces as regards real commercial business; so far as publishing and advertisement were concerned, there was no recovery at all. In

Paris, the abundant use of postcards and the large number of publications relating to the war brought a certain revival, limited however by the scarcity of skilled labor. The situation as regards newspaper printing was unchanged. In general the printing and book industries were, during 1915, very unfavorably situated. They were affected by the slackening of the other industries on which they were dependent; they lacked skilled labor, for which, in printing, no other can be substituted; customers were scarce and hesitating; raw material unprocurable (some newspapers in the west of France were obliged to purchase paper in Holland); all commodities had greatly risen in price, and there was a shortage of power (gas, electricity); finally it had become impossible to keep the costly and indispensable machinery, often of foreign make, in proper condition. In these circumstances output declined by as much as one-half to four-fifths.

Endeavors were made to employ the labor of women and children, but this proved productive only when effectively stiffened by skilled hands. Certain printing firms however had already entrusted linotype machines to women; others lent their workmen to one another. In some towns the local newspapers had ceased to appear, and the printing-presses that issued them were employing only a restricted number of hands for a few hours a day. The well-known picture business of Épinal had only one-fifth of its personnel at work. The printing of theater and cinema bills, however, provided a good deal of employment, and an important firm at Toulouse making calendars, memorandum books, and stationery, was very busy.

Throughout 1916 conditions remained indifferent for the printing industry; presses were idle or worked only short hours, except such as were employed by the public services, and these had to ask for higher prices owing to the considerable increase in the cost of their raw materials (paper, type, chemicals, coal). In 1917 they lost the custom of the British Army Services, which set up their own printing-presses, with English labor and machinery, to carry out the large amount of printing required by them.

Early in 1917 there was a fairly general improvement of conditions, owing to a revival of commercial business. But the improvement was not very great, because of the scarcity of skilled workmen.

The printing industry, having no direct connection with the defense of the country, got few of its workmen exempted from military service, and continued short of the technical personnel indispensable to it. The employment of women had no doubt been generalized and gave satisfactory results, for they became compositors and feeders, and even managed rotary presses; but in some places even this class of labor was lacking, for women received much higher wages in munition factories. Moreover, as in previous years, raw materials were very difficult to procure; paper was extremely scarce, ink, turpentine, and string hardly to be obtained, and many presses where gas provided the motive power had to suspend work during the hours when the supply was cut off. The printing of books and catalogues continued at a standstill for lack of orders. The only presses that remained active, apart from newspaper presses, were those working for public or private administrations, employing two-thirds of their normal personnel; even these were short of men to run the presses.

No improvement was reported during 1918, although certain printers received important orders—work for munition factories, books for the army zone, printed matter for the trade and administrative services, etc. The printing of food-cards provided work for a few firms. But the shortage of skilled labor still prevailed, each call to the colors reducing the number of craftsmen available. Paper rose afresh and reached fantastic heights, and other raw materials continued scarce. Small presses dependent on gas for power could run only for a few hours a day.

For various reasons a recovery did not follow on the Armistice. Skilled labor, the lack of which had been so much felt, no doubt returned gradually. But the orders from munition factories had come to an end, those of the Government were reduced, and private customers held their hand, reckoning on a fall in the price of paper; it was now five times, and only fell in 1919 to four times, the pre-war price. Esparto paper manufactured in England—although esparto grass comes from Algeria—cost less in France than the same paper manufactured there. Facilities for transport were quite inadequate and hampered exports, so that consignments were divided up, and sent by parcel post. Still, a few places were reported in most areas in 1919 where the personnel employed had increased

and where business was satisfactory. The Lyons fair, for instance, had provided work for the printing-presses of the district; and newspaper presses were in general busy. It should be mentioned that many printing establishments in the Nord had had their machinery carried off by the enemy.

In 1920 "news" paper, which used to cost 30 francs the 100 kilos in 1914, fetched 300 francs; and a machine that was worth 16,000 francs in 1914 was now worth 80,000 francs. Wages had increased enormously and customers were fewer and fewer. And there was such a dearth of apprentices that printing firms were considering the organization of technical instruction. Nevertheless, at the end of 1919 and in 1920, certain establishments that had been closed since 1914 were reopened and the industry revived, especially in connection with commercial and private printing, and publishing—catalogues, classical works, novels, etc. The issue of periodicals was increasing; printers had taken on 80 per cent of their pre-war personnel and the percentage was slowly approaching to normal. In the Rouen area many small printers had disappeared, but their machinery had been bought by stronger firms, and a process of concentration was going on to some extent everywhere. But sale prices had not risen in anything like the same proportion as cost of production, and yet the public was puzzled by the prices and demurred at them. 'Editions de luxe' were multiplied, for the public had not previously become familiarized with their price.

Newspaper printing, like printing for administrative services, held, as we have seen, a specially privileged position, and deserves some short further notice. Newspaper managers, to overcome the crisis in the supply of paper, formed a syndicate representing the economic interests of the Press and comprising more than 200 dailies, and took divers steps with a view to obtaining from the Government the means of coping effectively with the dearth of paper. This dearth however continued; the daily home output early in 1916 was no more than 1,600 tons of paper, of which only 300 tons were assigned to newspaper production; as newspapers consumed 420 tons daily, 120 tons had to be obtained by import. In spite of this, the Paris dailies, at the end of 1916, had been able to face the crisis without increasing their price; they drew paper from Sweden and Norway, and had been allowed to import this on payment of a duty

of only 5 francs a ton, whereas illustrated papers had to use art paper and highly glazed paper, on which the duty was as high as 300 to 450 francs a ton.

Subsequently, when Sweden prohibited the export of cellulose, a fresh combination of Press interests was organized. Toward the end of 1917, the rise in the price of paper and other raw materials of newspaper production brought about a marked decline in the activity of newspaper printing. In 1918 the newspapers themselves, in order to meet these difficulties, proposed certain measures to enable printing to go on, and the printers accepted them without demur.

As regards *lithography* and *chromolithography*, these industries were specially hampered, throughout the war, by the lack of specially qualified labor. As early as the beginning of 1915, lithographic printers were receiving numerous orders, but work was carried on with difficulty. In the Marne, where they supplied labels for champagne bottles, business was normal, and in the Bordeaux area work proceeded actively.

There was some improvement in the middle of 1916 in the Cognac district, because the lithographic industry there produced chiefly labels for bottles, and the sale of cognac had revived. In the Nantes area it produced labels for preserved food tins, and printers were working ten hours a day. Chromolithography was less prosperous; its customers thought it unnecessary to advertise their wares, as they were all sold without difficulty. A firm that employed 250 hands before the war on the production of posters, on sign-writing on cloth, and on decoration of boxes, was now employing only 40 workmen and working exclusively for the army geographical service. However, a chromolithographic business producing high-class cardboard boxes for perfumery and confectionery succeeded early in 1917 in competing with German makers on the American, English, Spanish, and Russian markets.

Lithography suffered severely in 1918, except a few firms supplying registers to the great administrations, notably the railway administration.

The situation did not improve in 1919 after the Armistice: a label factory discharged two-thirds of its staff, as a result of the general commercial depression; and another important lithographic firm experienced a heavy reduction in its exports. The industry was seri-

ously hindered by the competition of English and presently of German manufacturers, who produced at low prices. Besides, in the north of France, the Germans had completely removed all the best of the plant from the lithographic presses. At the end of 1919 conditions improved, and there was a marked recovery in 1920 in certain branches of production.

In *binding* and *book-sewing* shops there was complete stagnation after the mobilization: some closed, others worked intermittently or in rotation. A slight recovery was reported at the end of 1915, thanks to cheap publications (short novels at 0 fr. 50 or 0 fr. 95). But binding, in spite of a slight revival, had no orders to execute.

The stagnation continued in 1916 and 1917. However, a few manufacturers of calendars, memorandum books, diaries, and stationery made a great effort to supplant German articles on the foreign market and succeeded in America and Spain, in spite of difficulties of transport. Their exports in 1917 were extended to Egypt, but there met with competition from England and the United States.

At the end of 1917 binding and sewing shops, except a few important firms, remained closed or employed only a restricted staff. In 1918, notwithstanding the high prices, orders for binding were plentiful; but labor was deficient both in numbers and quality. The position did not improve in 1919, for customers held back, preferring to await a fall in prices. However, at the end of that year there was an appreciable increase of work for book-sewers in the Paris area, and three businesses that had been closed since 1914 were reopened, because books for Alsace-Lorraine had to be urgently supplied. Binding however remained, in general, dull, most customers being economically disposed and leaving their books unbound. During 1920 both industries tended to revert to normal conditions.

In the *postcard* industry there was no revival until 1915. Of two factories in the Bordeaux area, one had to close; the other doubled its output, with the help of foreign labor. The situation remained favorable in 1916, one firm increasing its staff from 80 to 130 hands; the picture postcard industry was tending, apparently, to a constant development. In 1917 it was severely affected by the introduction of the new postal tariff, and also of the restrictions

imposed in England on the importation of luxury articles. Nevertheless business continued normal in many factories and a new factory was started.

During 1918, work increased continuously in the phototype and picture postcard industries; the sale of colored cards representing military subjects developed every day, notwithstanding the difficulties in the way of supply. In the Paris area, however, the volume of work had fallen off by 50 per cent, although a considerable part of the output was exported. Restrictions on import into England and Italy and exchange difficulties in Spain forced one firm in the Marseilles area to reduce its personnel from 120 to 45 workmen. During 1919 there was considerable development in the industry in various towns, hindered unfortunately by shortage of labor. In 1920 orders declined.

As regards *printed and engraved music*, French production before the war was much less than that of Germany; France imported from the latter country 195 tons out of a total import of 235 tons, or 83 per cent. Paris was the main musical center; there were in that city, in 1913, 35 firms and societies for the publication of music, 1,200 professors and composers of music, 20 choral societies, 14 brass bands, 28 orchestras, 2 lyrical and dance societies, and more than 20 philharmonic and symphonic societies. To these must be added private music and the music of theaters, restaurants, cafés, etc. France had always been an importer of musical publications and used to be literally invaded by German publications from Munich and especially from Leipzig.

Energetic measures were taken during the war to remedy this by the issue of cheap editions of classical music; an attempt may be noted, for instance, in 1917 by musical publishers to supersede the German editions which were disseminated all over the world. But the scarcity of specially qualified personnel checked the development of this interesting experiment.

CHAPTER XI

TEXTILES

As the textile industries have been very fully dealt with in a special volume of this series, we shall confine ourselves here to a compendious summary of statistical information.

Out of a total active population of 7,225,000 persons, 914,000 were occupied before the war in the textile industries. The machinery comprised more than 11 million spindles and more than 300,000 looms, and it was driven by motive power amounting in 1913 to 393,000 h.p. for steam-engines alone. As a result of this productive capacity the value of French imports of yarn and fabric of all kinds did not exceed in 1913 250 million francs, while the exports were five times as large, and were valued at 1,250 million francs.

M. Aftalion, the author of the special volume on this subject, estimates the loss in machinery suffered by the textile industry from the invasion of the northern and eastern departments as follows:¹

as regards motive power: two-fifths to one-half;

as regards wool: the whole of the wool-combing plants, 2,000 in number; 2,400,000 spindles (for spinning and twisting) out of 3,000,000, that is to say, four-fifths; 37,000 looms out of 55,000, or two-thirds;

as regards flax: 520,000 spindles out of 577,000, or nine-tenths; 22,000 looms out of 42,000, or more than half;

as regards cotton: looms were little affected, but 2½ million spindles were lost out of 7½ million, or one-third;

as regards silk: the loss was confined to some tens of thousands of schappe spindles, and to the looms of the Nord and Rheims.

Table 48 gives as regards the non-invaded portion of France the index-numbers of the personnel employed in the textile industries, according to the returns of the Labor Inspectors, at the

¹ As regards loss of personnel, see page 8. The labor employed in the textile industry in the invaded region may be estimated at 29.4 per cent of the labor employed in the whole of the French textile industry. A portion of it, during the war, was to be found in the non-invaded territory; some were refugees, others, mobilized or provisionally exempted men.

various periods of the war. It will be seen that at the moment of greatest activity, the textile works of the non-invaded territory were employing only four-fifths of their pre-war normal staff, from which it may be inferred that the personnel so employed did not much exceed one-half of that normally employed before the war in the whole of France. The table also gives the proportion of establishments at work.

TABLE 48

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	37	34
Oct., 1914	61	50
Jan., 1915	71	63
July, 1915	78	71
Jan., 1916	79	76
July, 1916	79	78
Jan., 1917	81	81
July, 1917	85	82
Jan., 1918	85	81
July, 1918	89	79
Jan., 1919	81	80

The returns for January 1920 relating to the whole of France give as index-numbers, for establishments, 94; for personnel, 85.

The following is a brief summary of the situation of the various branches of the industry in 1913 and during the years of the war. It will be useful to compare with it the table of imports and exports contained in Appendix XXXI.

I. *Wool.* France in 1913 was far from producing all the raw wool required for her consumption. But M. Aftalion has shown that in 1913 each branch of the industry, wool-combing, spinning, and weaving, produced more than the home market required, and was able to export,¹ so that the proportion of products of each of these branches remaining in France and consumed there was diminishing.

¹ It should be borne in mind as regards Appendix XXXI, where raw wool, combed wool, and noils are grouped together, that France imported raw wool and exported combed wool.

The difficulties that arose in the course of the war reversed this tendency, so that each branch of the wool industry was obliged to import more and more.

*Quantities of Woolen Goods Manufactured and Consumed
in France in 1913.*

	<i>Tons</i>
Quantity of scoured wool retained in France	104,000
<i>Deduct</i> excess of exports over imports of combed wool and wool waste, and evaporation	31,200
	<hr/>
Quantity of wool available for spinning, and presumed output of yarn	72,800
<i>Deduct</i> excess of exports over imports of yarn	12,400
	<hr/>
Quantity of yarn available for weaving and presumed output of cloth	60,400
<i>Deduct</i> excess of exports over imports of cloth	14,000
	<hr/>
Quantity of cloth retained in France, and presumed consumption	46,400

A glance at Appendix XXXI will show to what an extent recourse was had during the war to the import of woolen yarn and cloth; the excess of imports over exports was as shown in Table 49.

TABLE 49

	<i>1915</i>	<i>1916</i>	<i>1917</i>	<i>1918</i>
	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>
Combed wool and waste	2,700	6,200	5,600	3,700
Yarn	4,600	6,800	6,900	6,000
Cloth	31,600	41,600	22,000	14,700

Table 50 may now be constructed showing the quantities of woolen goods manufactured and consumed in France during the war.

It will be seen how great was the consumption of woolen tissues in France, particularly in 1916, but this was rendered possible only by large purchases abroad, which seriously impaired the balance of foreign trade.

II. *Cotton.* All raw cotton consumed in France comes from abroad. The quantity consumed in 1913 was 327,000 tons or 7.5

TABLE 50

	1915 tons	1916 tons	1917 tons	1918 tons
Quantity of scoured wool retained in France	31,400	34,500	29,800	24,600
<i>Adding</i> excess of imports of combed wool and waste, and <i>deducting</i> evaporation, we have the wool available for spinning and presumed output of yarn	32,700	39,100	34,000	27,200
<i>Adding</i> excess of imports of yarn, we have the yarn available for weaving and presumed output of cloth	37,300	45,900	40,900	32,200
<i>Adding</i> excess of imports of cloth, we have the cloth retained and presumably consumed in France	69,900	87,500	62,900	47,900

per cent of the world consumption. Imports, of which 78 per cent came from the United States, amounted to 329,136 tons and exports to 57,840 tons or one-sixth of the imports.

M. Aftalion summarizes as follows the general situation in 1913 as regards the production and consumption of cotton goods. The productive capacity of the French spinning and weaving industry at that time exceeded the needs of the home market.

Production and Consumption in France of Cotton Yarn and Fabrics, 1913.

	<i>Tons</i>
Approximate output of yarn	236,900
<i>Deduct</i> excess of export over import of yarn	4,500
Quantity of yarn available for weaving and approximate output of fabric	232,400
<i>Deduct</i> excess of export over import of fabric	45,900
Quantity of fabric retained in France, and approximate French consumption	186,500

The capacity of output diminished during the war, while demand, especially that of the armies, increased. To meet the latter, the

excess of exports over imports that prevailed before the war was replaced by the excesses of imports over exports shown in Table 51.

TABLE 51

	1915	1916	1917	1918
	tons	tons	tons	tons
Excess of imports of yarn	21,400	32,800	25,500	33,900
Excess of imports of fabrics	42,700	15,600	9,200	31,300

The position of France's foreign trade in cotton goods was thus completely reversed to her disadvantage by the war; it may be set out as in Table 52.

TABLE 52

	1915	1916	1917	1918
	tons	tons	tons	tons
Approximate output of yarn	175,400	132,900	126,500	109,100
<i>Adding</i> excess imports of yarn, we get the quantity of yarn available for weaving and the approximate output of fabric	196,800	165,700	152,000	143,000
<i>Adding</i> excess imports of fabric, we get the approximate French consumption of fabric	239,500	181,300	161,200	174,300

The figures of imports and exports of cotton yarn and cotton fabrics given in Appendix XXXI will show how unfavorable the commercial situation in respect of these had become.

III. *Flax, hemp, ramie, and jute.* France possessed in 1913 important works for dressing, spinning, and weaving flax and hemp, and exported the finished products in large quantities. But she produced only a small part of her raw materials, and the Appendix shows her to have been a large importer of these fibres.

As regards flax, only 65,000 acres were cultivated, in Brittany and in the center and west of France. The French production was about 1 per cent of the world production, while that of Russia was

77 per cent. Without going into the detailed figures of the output of dressed flax and tow we may extract the following statistics relative to 1913.

	<i>Dressed flax</i> <i>tons</i>	<i>Tow</i> <i>tons</i>
Production from home-grown flax	4,500	8,500
Imports (estimated quantity in terms of dressed flax and tow)	49,622	47,039
Exports	3,604	5,749
<i>Consumption</i>	50,518	49,790

French imports represented 98 per cent of the consumption; it may be imagined what the suppression of the Russian imports must have meant for French industry.

As regards *hemp*, French production amounted to about 2 per cent of that of the whole world (some 34,000 acres were cultivated in the Corrèze and in the north-west). Reducing the figures of 1913 to terms of dressed hemp and tow, we get the following:

	<i>Dressed hemp</i> <i>tons</i>	<i>Tow</i> <i>tons</i>
Production from home-grown hemp	8,556	4,278
Imports:		
Raw foreign hemp	15,566	7,750
Dressed hemp and tow	352	4,157
<i>Total</i>	24,474	16,185
Exports	457	645
<i>Consumption</i>	24,017	15,540

We shall see the extent to which imports were disturbed during hostilities.

As regards *ramie* and *jute*, France produced none of the raw material, and the supply is sufficiently indicated by the customs figures (Appendix XXXI). It will be observed that there was a great decline in imports, which fell from 110,000 tons in 1913 to 67,000 in 1917, and 9,000 in 1918, and then rose again to 105,000 in 1919.

M. Aftalion gives an interesting estimate of the position of the *flax and hemp industries* in 1913 and during the war, pointing out that it is difficult to draw up a general table of the production and

consumption of hemp, because the quantity absorbed by the rope industry is not known. We may assume however that the whole of the raw material was spun and woven and so obtain figures which, if not absolutely exact, yet give a fair idea of the changes brought about by hostilities. Leaving on one side imports of oilcloth and linoleum, we see that before the war the quantities produced and consumed in France were diminishing as manufacture developed, the surplus going abroad and forming an excess of sales over purchases.

Production and Consumption in France of Linen and Hempen Yarn and Fabrics, 1913.

	<i>Tons</i>
Approximate output of linen and hempen yarn	119,000
<i>Deducting</i> an excess of exports of yarn over imports of 10,800 tons, we get an approximate output of linen and hempen fabrics of	108,200
<i>Deducting</i> an excess of exports of fabrics over imports of 4,500 tons, we get an approximate consumption of fabrics of	103,700

But the excesses of exports of pre-war days were replaced during hostilities by the excesses of imports indicated in Table 53.

TABLE 53

	<i>1915</i>	<i>1916</i>	<i>1917</i>	<i>1918</i>
	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>
Excess of imports of yarns	600	3,600	8,900	2,500
Excess of imports of fabrics	900	1,600	5,000	5,300

From this may be deduced Table 54, giving the production and consumption in France during the war.

With regard to *ramie*, which is mainly employed in fabrics mixed with linen thread, we shall confine ourselves to saying that there were in France in 1913 four mills spinning this fiber. As for *jute*, we may draw attention to the following figures, some of which are taken from Appendix XXXI. There were about 100,000 spindles spinning jute in France in 1913; the output of yarn was 108,000 tons and the import 27 tons; the export was 6,738 tons and French consumption about 100,000 tons. The weaving of jute, which employed about 8,000 looms in the Dunkirk and Somme

TABLE 54

	1915	1916	1917	1918
	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>
Approximate quantity of yarn produced	16,900	36,600	24,900	31,200
<i>Adding</i> the excess of imports of yarn over exports, we obtain the approximate output of fabrics	17,500	40,200	33,800	33,700
<i>Adding</i> the excess of imports of fabrics over exports, we obtain the approximate consumption of fabrics in France	18,400	41,800	38,800	39,000

valley districts, and (for soles of shoes) in the Pyrenees, produced about 41,000 tons; imports of fabric amounted in 1913 to 28,470 tons and exports to 18,738 tons; about 51,000 tons were consumed. Weaving of jute suffered little during the war, notwithstanding the stoppage of work at Lille, Halluin, and Roubaix, and in spite of the proximity of the front to the factories of the Somme. The demand was urgent, especially for sand-bags and sacks for food supplies. Imports increased accordingly: the excess of imports over exports was, in 1913, 10,000 tons; in 1915, 46,500 tons; in 1916, 42,500 tons; in 1917, 59,000 tons; in 1918, 43,000 tons; in 1919, 57,500 tons.

IV. *Silk*. We have said that factories spinning and weaving silk were little affected by the invasion. The silk industry, having mainly developed in the districts of Lyons, St.-Étienne, and in the Rhône valley, had only 4,000 hands in the invaded region out of a total personnel of 126,000 (census of 1906). None the less silk, a luxury article, suffered at the outset of the war from a reduced demand; in the later years of the war, on the other hand, fashion and the needs of aviation operated in its favour. Supplies of raw material, drawn principally from abroad, were a source of considerable difficulty. It will be seen from Appendix XXXI that imports of raw silk fell in 1915 to less than one-half the tonnage of 1913, and recovered slowly to more than four-fifths in 1918; net exports of

silk yarn, which amounted to 1,100 tons in 1913, fell in 1915 and 1916 and were replaced in 1917 by an excess of imports over exports, an excess that reached 650 tons in 1918; and the net exports of silk fabrics (of which France was a large exporter) declined from 5,300 tons in 1913 to 2,500 tons in 1918. These figures reveal the short supply of raw material during the war, the growing need of silk yarn for domestic consumption, and the dullness of foreign trade in luxury commodities.

We may add, as a further characteristic of the situation, that, in 1912, the French production of cocoons (2 per cent of the world production) placed only 505 tons of raw silk at the disposal of French manufacturers; while these drew about 4,150 tons from abroad. If we leave aside yarn and intermediate products and come to silk fabrics, we find that France before the war produced 16 per cent of the world's consumption of these; her output in 1912 was valued at 421 million francs, of which 97 per cent came from the Lyons area. In 1913 the output of this area amounted to a value of nearly 468 million francs, and the total French production to more than 480 millions; the total French export of fabrics (5,300 tons) represented a value of 329 million francs.

As regards the industry of the Lyons area, M. Aftalion gives the following figures of the value of its output of silk fabrics during the war (silk cloth, velvet and plush, crêpe de Chine, muslin, tulle and lace, trimmings, fabrics for cartridges and aeroplanes, and other fabrics) :

1913	467,700,000 francs	1917	548,500,000 francs
1915	319,500,000 francs	1918	699,500,000 francs
1916	411,700,000 francs		

We may note finally that the *artificial silk* industry was in full course of development in France before the war.

M. Aftalion points out that it is impossible to complete our statement regarding the silk industry by a table, such as has been prepared for other industries, summarizing its output at the various stages and showing consumption, because of the important and varying quantities of other substances that are mixed with silk in the course of manufacture. At most, by a comparison of available data, certain plausible hypotheses may be put forward. He has per-

sonally prepared a table of the silk material subjected to manufacture during the war and of the fabrics of pure and mixed silk exported. His figures and his conclusions merit reproduction:

	<i>Silk and floss silk supplied to the industry tons</i>	<i>Excess of exports of pure and mixed silk over imports tons</i>
1913	5,764	5,797
1915	2,420	5,541
1916	3,641	5,399
1917	4,349	3,772
1918	6,579	3,619

In considering these figures we must take into account the important quantities of other materials mixed with silk in the process of weaving; this explains the fact that the excess of exports in the above table, comprising as it does mixed silk, is frequently larger than the supply of pure silk.

The table does not give the figures of actual output; but if one assumes that the respective proportions of silk and other textile materials mixed therewith varied little if at all, it appears that the output of silk fabrics declined heavily in 1915, and then rose progressively, especially in 1918.

As regards consumption, the table shows that the excess of exports, after having fallen off to only a moderate extent in 1915-1916, showed a sharp decline in 1917-1918, so that its curve diverged greatly from that of the supply of silk material to the industry. The latter fell very low in 1915 and then rose until, in 1918, it was above the pre-war level. The curve of exports on the contrary dropped but little in 1915, and then fell more and more in the following years. Between 1915 and 1918 we have a rapidly rising curve of supply, a rapidly falling curve of exports.

M. Aftalion arrives accordingly at the following conclusions: in 1913 the figure of supplies (of silk and floss silk) and that of excess of exports are about equal; in 1915 and 1916 the latter much exceeds the former; in 1917 and 1918 the position is reversed. Therefore in 1915 and 1916 the French consumption of silk stuffs must have greatly diminished; in 1917 and 1918 it must have perceptibly revived.

On the average of the years 1915-1918, since the excess of exports

declined less than did the quantity of silk supplied to the industry, the silk fabrics retained in France for consumption must presumably have diminished. Since moreover a growing proportion of the fabrics retained in France was employed for the needs of the army, it may be concluded that there was a marked reduction in the quantity consumed by the civil population.

CHAPTER XII

MAKING OF TEXTILE GOODS AND CLOTHING; STRAW, FEATHERS, AND HAIR INDUSTRY

WE shall begin by giving a sketch of the pre-war situation of the industries which worked up textile fabrics. French millinery, linen, needlework, and ready-made clothing had spread far and wide the fame of French taste, and particularly of Parisian taste.

The ready-made clothing trade (garments for men and women, linen goods and cravats) exported to the value of more than 250 million francs a year against only 11 million francs of imports. It is difficult to draw up statistics in respect of an industry so subdivided as the clothing trade, and to distinguish the domain of ready-made clothing from that of tailors and dressmakers. It has been estimated however that the output of ready-made clothing in 1913 was approximately as follows:

	<i>Value</i>
Ready-made garments for men	120 million francs
Ready-made garments for children	30 million francs
Ready-made garments for women	250 million francs

But it is particularly difficult to estimate the value of this last item, owing to the extreme diversity of the materials, ornaments, and trimmings employed.

The output in 1913 of ready-made linen goods was valued at 200 million francs and that of cravats at 15 to 20 millions.

Table 55 gives the figures of the foreign trade in ready-made clothing (transit excluded). It should be observed that the customs returns do not include the export of what travellers carry on their persons or in their trunks.

The value per ton of goods was very high, especially as regards exports (17,000 francs per ton imported, 46,000 francs per ton exported), and still more as regards women's garments (131,000 francs).

The effect of the war on this industry was to develop the manufacture, and particularly the import, of ready-made garments for men, of linen goods and of miscellaneous articles, in order to meet

TABLE 55

FOREIGN TRADE IN READY-MADE CLOTHING (VALUE IN FRANCS)

	<i>Ready-made garments for men</i>	<i>Ready-made garments for women and children</i>		<i>Ready-made linen goods</i>	<i>Cravats</i>	<i>Miscellaneous</i>
		<i>Silk</i>	<i>Other fabrics</i>			
Imports	3,095,000	929,000	2,885,000	1,300,000	515,000	2,083,000
Exports	24,172,000	21,672,000	138,915,000	57,000,000	710,000	10,487,000

above all the requirements of the army. Military clothing factories were particularly busy. But the scarcity of French fabrics and the loss of the factories of Lille (which after Paris was the principal center of production) caused a great decline in exports (see Appendix XXXII) ; there was a reduction of 85 per cent in the export of men's garments (even as regards exports to Algeria), and of 50 per cent in the export of women's garments made of fabrics other than silk ; the export of garments made of silk increased.

Out of a total value of 160,580,000 francs of women's ready-made clothing (dresses and cloaks), France used to export to the value of 71 million francs to allied countries, of 57 millions to neutral countries, and of 32 millions to enemy countries. The total decline in exports far exceeded these last 32 millions, for the reason given above ; and this although French firms were relieved of the competition of German and Austrian makers, who used not infrequently to counterfeit their wares.

Millinery was of no less importance to France than dressmaking, and for similar reasons. This industry and the flower and feather industry are interdependent and are accordingly grouped together. But almost the only statistics available in regard to them are those of the customs. And these unite under the general designation of 'Millinery' (worth 2,400 francs the 100 kilos) the expensive hats produced by fashionable milliners, which fetched from 100 to 400 francs and more apiece before the war, and the cheap trimmed hats which sold for 4 frs. 80. Similarly the value of feathers for trimming varied from 20 francs to 8,000 francs the kilo. The estimated total value of French exports and imports of millinery is therefore a mere approximation, the more so that customs declarations, especially for export purposes, are frequently incorrect. Subject to these

remarks, the figures of French foreign trade in millinery, etc., in 1913, transit excluded, are as shown in Table 56.

TABLE 56

Exports.

	<i>Millinery</i> <i>Value in francs</i>	<i>Artificial flowers</i> <i>Value in francs</i>	<i>Feathers for</i> <i>trimming</i> <i>Value in francs</i>
To enemy countries	967,000	628,000	5,125,900
To allied countries	53,531,600	14,685,000	34,060,800
To neutral countries	976,000	3,428,000	17,529,600
To other countries	1,173,757	361,388	482,895
<i>Total</i>	56,648,357	19,102,388	57,199,195

Imports.

From enemy countries	14,400	440,000	5,232,400
From allied countries	76,800	128,500	49,554,600
From neutral countries	4,800	2,500	4,438,000
From other countries	....	4,000	16,532,850
<i>Total</i>	96,000	575,000	75,757,850

This table shows the extent to which French exports of millinery exceeded imports (six hundredfold). Of these exports enemy countries took to the value of 967,000 francs, allied countries to the value of 53,532,000 francs. Out of 96,000 francs' worth of imports, enemy countries supplied millinery to the value of 14,400 francs, allied countries to the value of 76,800.

The *corset* industry, whose principal centers were Paris and Lyons, requires a large number of accessory goods: busks, steels, eyelets, and whalebone; corset-makers before the war consumed 800 tons of special steels alone. In 1913 France imported 79,886 pairs of corsets, worth 319,544 francs, and exported 209,850, worth 2,518,200 francs. In 1915 imports had fallen to 8,757 pairs and exports to 104,394. England in particular prohibited the import of expensive corsets. (See Appendix XXXII.) We should especially remind the reader here that the figures of the statistics, particularly in respect of exports, are understatements, not only

because customs declarations are inaccurate, but also because many articles, and above all the most expensive ones, are conveyed by travelers on their persons or in their trunks.

We may also note that the 1,066,000 umbrellas and parasols exported in 1913 were worth no more than 3,945,000 francs, of which only 72,000 francs' worth went to enemy countries; while these, on the contrary, sent larger quantities to France: to the value of 415,000 francs out of a total of 574,000 francs imported. But these are only minor items in the whole.

Table 57 gives the index-numbers of the establishments at work and of the personnel employed at the dates of the several inquiries in the textile goods and clothing, and in the straw, feathers, and hair industries (French territory as reduced by invasion).

TABLE 57

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	53	31
Oct., 1914	59	43
Jan., 1915	69	55
July, 1915	79	65
Jan., 1916	87	72
July, 1916	86	77
Jan., 1917	85	78
July, 1917	85	78
Jan., 1918	90	83
July, 1918	86	85
Jan., 1919	83	87

The returns for January 1920, relating to the entire territory, give the following index-numbers: establishments, 94; personnel, 93.

Appendix XXXII gives the figures of the foreign trade (transit excluded), during the war, in the principal products of these same industries.

One sees in these various figures evidence of the continuous improvement during the period in question in the numbers of the personnel employed in the clothing and similar trades; the establishments situated in the non-invaded portion of the territory ended

by employing four-fifths of their normal staff; but we must take into account the enormous factories situated in the invaded zone whose output before the war served in part to supply the remainder of the country. The tables also furnish evidence of the decline of foreign trade and particularly of French exports during the war. The reduced weight of exports particularly affected those expensive commodities and luxury articles the trade in which might have supported the French exchange and maintained the country's prosperity, and which it had been hoped, at the outset of the war, to sell in large quantities to the allies and to neutrals.

We shall now follow, with the help of the reports of the Labor Inspectors, the vicissitudes of the clothing industries, beginning with *military clothing* and those accessories which, being destined for the army, followed a similar course. They were momentarily affected by the mobilization, but were reorganized as early as October 1914 in order to meet military requirements. They at once found an ample supply of labor in the numerous 'work-rooms' set up for relief purposes which were a prominent feature of the first years, and especially of the first months, of the war. These institutions applied to the military authorities for work for the needlewomen, milliners' assistants, refugees, and in general for all those workwomen whom unemployment left without resources.

During 1915 the manufacture of military clothing and equipment was very active. Tailors and drapers, and even cloth-factories, opened premises for this purpose. Outwork was much developed by sub-contractors, military master-tailors, etc. The army administration took steps to secure normal wages for the needlewomen out of work and for refugees seeking employment; these measures were shortly made thoroughly effective by the law on the minimum wages of workwomen working at home. About the 1st July 1915 outwork became very widespread; as many as 25,000 workwomen were reported engaged in it in the Toulouse area alone. Work-rooms were still very numerous, although their number diminished with the growing organization of the industry. But a sudden suspension of orders brought about a recurrence of unemployment in September 1915, in spite of the revival of civilian tailoring. This crisis, like others resulting from the fluctuation in the volume of orders, par-

ticularly affected casual workers and outworkers. Those employed in clothing works were seldom out of employment.

The situation of the military clothing industry retained these same features until the Armistice; it was active as a whole, but varied at different seasons and in different areas according to the flow of military orders. The latter tended to diminish. But the munition factories carried off female labor from the clothing industry at a corresponding rate or even faster, owing to the high wages they offered. This was a source of complaint especially at Toulouse, where tailoring hands had been so numerous in 1915; it was feared that when they resumed their peace occupation they would be found to have lost their skill. Military clothing had to be made to a constantly increasing extent in the country districts. On the other hand manufacturers were multiplying appliances and machinery so as to increase output. We may note also the conversion of the relief work-rooms—such as had survived—into regular professional work-rooms, run by Municipalities, Labor Exchanges (one of these employed 2,000 workwomen), orphanages, and co-operative societies. The military authorities encouraged this process by developing direct orders to the exclusion of sub-contractors and to the benefit of the occasional worker; but many refugee women, having no sewing-machines, were unable to take advantage of these measures. Reference should also be made to the important work done as regards the renovation of used military clothing, with a view to economy and in consequence of the dearth of cloth; also to the work undertaken for foreign armies (English, Belgian, and Serbian). Finally we may mention the large amount of steady work on coarse easy jobs (making of sand-bags and sacks for packing, out of jute cloth) which furnished employment for unskilled labor.

The reaction after the Armistice was not very acute; manufacturers were allowed to complete a number of current contracts; and, further, there was the civilian clothing to be supplied to demobilized men. Moreover the civilian tailoring trade revived, as we shall see, and female labor became scarcer as demobilization proceeded and women returned to their domestic duties; refugees went back to their homes; the remaining work-rooms closed; and the situation became normal once more.

In the *ready-made clothing* trade for men and in the tailoring

trade, after the almost complete stagnation which followed on the mobilization, the usual seasonal fluctuations ensued; sometimes the army increased its orders in the dull season in order to take advantage of the labor available. But, in general, orders were not plentiful; many men had been mobilized, civilians restricted their purchases, and cloth was dear and rather scarce. Manufactories of ready-made clothing and even certain tailors turned their attention to military clothing. Many tailors, especially in the districts near the front, made uniforms to measure. Generally speaking the position of civilian tailors was a difficult one.

Appendix XXXII, imports and exports of clothing for men, illustrates this general remark: exports fell in 1915 and 1916 to one-fifth, in weight, of the pre-war figure (except as regards silk garments, which maintained their level). But for the active production of military clothing, the crisis would have been far more acute than it appears to have been from the periodical reports of the Inspectors.

A few details may be noted. In the midst of the general stagnation of 1915 and 1916 there were a few districts, Marseilles for instance, where trade was busier. On the other hand the manufacture of velvet garments was in jeopardy, for their export was checked. In 1917 there were rather more orders for civilian clothing, a great increase of demand, in particular, for workmen's clothes; but the stock of English cloth and cloth from the north of France was exhausted, and labor was scarce and was being diverted to munition factories. A firm that employed 300 hands before the war, now had only 40. In some localities a scarcity of piece-workers was reported. Nevertheless, at the end of 1917, there were no complaints in several areas. A large Paris shop was reported to be employing 200 more workwomen in its clothing work-rooms than before the war.

In 1918 manufacturers of civilian clothing were unable to procure cloth in sufficient quantities, because of the limitations on imports. Import licenses, it was said, were too restricted, and should have been based on the size of the various establishments, not on their imports during 1916, when stocks were still being used up. Some firms ran short of coal; others were unable to replace their worn-out sewing-machines of American make; consignments suffered endless delays in transport. In a large center of the trade,

where 10,000 hands were normally engaged, certain firms that used to employ 600 women had difficulty in finding work for 200, and no goods were exported.

However, some districts remained fairly busy, and certain military clothing factories were setting up machinery with a view to undertaking civilian supplies. In Paris conditions were uneven; the manufacture of working clothes remained active.

After the war the production of civilian clothing for the demobilized men gave rise to some degree of activity, and led to the re-employment of women who had left the clothing trade to enter munition factories. One firm employing 580 hands organized an export business to Luxemburg and Rhineland. But in general buyers held back; the volume of business at Lyons was reported as having much diminished, and some employers reduced their personnel. In other places there were complaints that licenses for imports of English cloth were on too small a scale. In 1919 there was some recovery in the tailoring trade in connection with the making of French and allied uniforms, but skilled labor and piece-workers were short. Civilian customers, in view of the high price of cloth, turned to ready-made goods or had their old clothes renovated or altered.

At the end of 1919 the ready-made clothing trade for men recovered its prosperity in spite of the high price of cloth, and in the Lyons area developed remarkably. Throughout the south of France, manufacturers were overwhelmed with orders, especially from rural customers who had grown rich. But labor was correspondingly scarce: workwomen were now less attracted to the towns from the country in spite of the lure of high wages. The numerous clothing works of the liberated region had nearly all reopened their doors and some had extended their premises. Men's tailors had many orders, but lacked skilled labor. The high price of materials, however, still drew customers to ready-made goods.

Dressmaking and *millinery* were among the more severely tried industries; we have already pointed out (page 205) that their exports declined in weight year by year during the war, and these exports were a vital factor in their prosperity. But we observed that while exports of articles made of fabrics other than silk

dropped to one-half, then to one-third (1917), and then to one-seventh (1918), of the 1913 figure, the export of silk articles recovered as early as 1915 to the level of 1913, then exceeded it by 40 per cent in 1918, and in 1919, after the war, attained a weight four times that of the pre-war period. Fashion played its part in this transfer of activity from one branch of the industry to another, and the scarcity of woollen fabrics in France during the war also certainly exercised an influence. The transfer was unquestionably profitable to France and served to revive, in the latter years of the war and particularly after the Armistice, the prosperity of dress-making and millinery. We shall see the creditable efforts made by dressmakers to continue exports in spite of difficulties; we shall also note the recovery of the luxury trades, encouraged as early as 1917 by the large profits obtained by army contractors and also by farmers.

We need not dwell on the depression that followed mobilization; for several weeks there was a complete stoppage of work. Nor on the fact, which dominates the whole of this monograph, that unemployed women rapidly found work in the military clothing trade,—many even in munition factories; indeed at certain moments employers called the attention of the public authorities to the danger that the professional skill which turned out elegant dresses might be impaired by this migration—an exaggerated fear, which however bears out the view that the activity in the manufacture of munitions saved the dressmakers' assistants from unemployment.

At the beginning of 1915 conditions were indifferent. Trade was good in a few places: at Calais, where it had to meet the wants of refugees who had fled from the invasion in their summer clothes; also at Marseilles and particularly at Toulouse, where the business season was estimated at two-thirds of the normal. In other places the situation was generally unfavorable. At Bordeaux, dressmakers had re-engaged only a quarter of their hands; on the Riviera the season was a complete failure. In Paris, the impulse given in January 1915 by the visit of American buyers lasted a couple of months, but the personnel employed never reached its full numbers. From March onward dressmakers worked for French customers, but to a limited extent, and there was no luxury: only simple dresses, tailor-

mades, and renovations. Milliners fared a little better. In the artificial flower trade work was done for export, which was no longer hampered by German competition.

It was found in July 1915 that the dressmaking and millinery season had been much shorter than usual and unprofitable. The great dressmakers had almost ceased to export. In Paris, however, small dressmakers were doing better than the large houses. A recovery was observed in the third quarter of the year, as the result of a radical change of fashion. Exports, in August, succeeded almost beyond hopes. But in the Nantes, Nancy, and Rouen areas the trade remained rather dull, and millinery did not follow the improvement in dressmaking.

At the end of 1915, allowing for a marked reduction of personnel, conditions in Paris remained fairly favorable for dressmaking. But customers would buy only inexpensive goods, while the price of materials had risen greatly; that of fabrics had doubled, and dressmakers had to employ reduced quantities in making garments. In the provinces conditions varied; stagnation continued at Dijon and Lyons, and shops supplying wealthy customers had no orders. On the other hand business was good at Marseilles and Nantes, and personnel there reached three-fourths of the pre-war numbers.

A few figures will indicate the energy shown by dressmakers in exporting their wares (dresses and cloaks) during this first year of the war. We may neglect imports, which amounted to a value of only 2,285,000 francs, against 3,814,000 francs in 1913. We have seen that exports amounted in 1913 to more than 160 million francs. If we deduct from this figure about 32 million francs of export to the enemy countries, we have 128,885,000 francs of exports to allied and neutral countries. In 1915 exports of dresses and cloaks amounted to 97,410,000 francs, or 60 per cent of the total exports of 1913, and 75 per cent of the exports to allied and neutral countries. A great improvement in the value of the exports of silk garments was already manifest: 23,500,000 francs against 13,000,000 francs in 1913 to allies and neutrals. On the other hand there was a marked decline in garments made of other fabrics: 73,900,000 francs against 115,500,000 francs in 1913. It was business with allied countries that had chiefly declined; exports to neutral coun-

tries had increased by 4 million francs,¹ a sign of remarkable energy on the part of the trade (see Table 58).

TABLE 58

		<i>Value</i>	
		<i>1913</i>	<i>1915</i>
		<i>francs</i>	<i>francs</i>
<i>Garments exported</i>			
To allied countries	{ Silk	7,164,000	8,575,600
	{ Other fabrics	64,329,000	27,384,000
<i>Total</i>		71,493,000	35,959,600
To neutral countries	{ Silk	6,176,000	14,959,600
	{ Other fabrics	51,216,000	46,490,900
<i>Total</i>		57,392,000	61,450,500

The recovery in dressmaking was maintained in 1916; it was only at Mentone and Cannes that Labor Inspectors still reported stagnation. In Paris, conditions in the trade were not far from normal except as regards medium-sized houses. But it was mainly foreigners, especially from North and South America, who patronized the great houses; French customers had gone to the small firms since the outbreak of war. In the middle of 1916 most dressmakers' workrooms, to meet the change in fashion, were doing overtime; and there was even here and there a shortage of labor, because assistants were dissatisfied with the so-called 'war-wages' and were inclined to join munition factories. In Paris and Bordeaux, orders from England and America were less plentiful than had been hoped, but the season on the whole was more profitable than the previous one. In the rich vine-growing districts of the south, in particular, millinery and dressmaking were almost as busy as before the war. In a few districts there was no improvement, and the proximity of the enemy lines in some places drove away the wealthy clientele. In Paris, firms working 'on commission' had occupation, but complained of the constant decrease in the number of American buyers, of the restriction of foreigners' purchases, of the prohibition on the import of clothing into Russia, and of the great difficulties in the way of transmission of goods, notably to America.

¹ For weights see Appendix XXXII.

In 1917 there was a rather serious and increasing dearth of labor, due to the competition of the military offices, and to the high wages offered by munition factories; apprentices were difficult to recruit. The year resembled the previous one, but with less activity. Prices were high, the public further restricted their purchases, bought ready-made goods, or made their own clothes at home from patterns. Many of the less important firms and small employers, with only modest resources behind them, found expenses too heavy in proportion to the extent of their business, and closed. Export orders had ceased to come from England, and only few came from Spain and Switzerland. American orders proved increasingly difficult to carry out: they arrived all at once and there were not enough workwomen to deal with them; moreover transport facilities were very defective. Appendix XXXII bears this out by showing a serious decline in exports. One large dressmaking firm, however, was still doing business in America, for the managers themselves went there, taking their models with them, and had the work done on the spot. The winter season proved satisfactory in towns where industry was busy.

The same general remarks apply to the year 1918; activity was on the whole still further reduced and the six-day week came into general observance. The great dressmakers of the Lyons area complained that the volume of business had fallen progressively since 1914 by 40 per cent, 50 per cent, and finally 60 per cent. On the other hand the big shops selling ready-made clothes did an improved business in 1918, dealing with a transitory clientele of refugees, foreigners, and people from the country districts, who bought on the spot the dresses that pleased them. Notwithstanding the course of events, the great dressmakers made arrangements for the visits of buyers and prepared their collections of models.

Millinery was less severely tried, and had a fairly good season, but workwomen and above all skilled milliners were scarce. Wholesale millinery was active, although consignments of Italian and Japanese straw arrived haltingly and silks and ribbons were at impossible prices.

Conditions did not improve after the Armistice. It was hoped that numerous buyers would come from America, but passports were given only to such as had already been coming during the war.

Dressmakers and milliners however made strenuous efforts to provide collections of models equal to those of former days and to recover their foreign clientele. The great dressmaking firms and the work-rooms of the great shops increased their staff, but the medium and small makers found it impossible to raise their prices in proportion to cost of production.

In the second half of 1919 pre-war conditions were restored in dressmaking and millinery. In spite of the fantastic price of materials, the victory celebrations, the revival of racing, the numerous weddings that the war had postponed, brought about a great increase of orders; some firms had to refuse orders. There was practically no dead season. But there was a shortage of labor, as many women had remained in factories or in military offices. An endeavor was made to increase export, but American customers were still prevented from coming over freely to purchase. Important Parisian dressmakers stated that the great dressmaking houses, which in 1917 and 1918 had produced only one-third of their normal output, had in 1919 produced one-half and hoped to do more. There was a marked increase, in particular, in the prosperity of the big shops.

At the end of 1919 the great dressmakers and milliners were generally busy, and there was a good recovery in January, due to the numerous balls and weddings. In Paris the recovery was very marked, and orders from abroad abounded; but small businesses lacked hands and were unable to pay the high wages current. Many women, instead of returning to dressmaking with comparatively low pay, took employment in boot or porcelain factories, in spinning and weaving mills, and in banks and offices. The scarcity of apprentices was acute: parents were placing their children where they could at once earn wages.

What we have said about dressmaking applies in the main to the *fur* industry. As regards raw material, Canadian furs took the place, to some extent, of the Russian furs no longer available. There were, here and there at various moments, special periods of prosperity: at the end of 1915 at Marseilles and on the Riviera, owing to the presence of foreigners and immigrants; at the end of 1916, owing to the extremely cold season; in 1917 some recovery was noted, due more to the alteration of old furs than to new work. In the middle of 1919 there was a scarcity of raw material, mainly in

consequence of the political situation in Russia. At the end of that year the trade in peltry increased, in spite of very high prices. Foreign countries were monopolizing the ordinary fur garment trade, and many furriers took to the preparation of skins instead, except as regards the very expensive furs for customers to whom money was of no account; a zibeline cloak would fetch 250,000 francs. Furriers in the south had done very well and sold off their stocks.

Makers of *linen goods* were fairly favorably situated immediately after the mobilization, as a result of their contracts with the military authorities for the supply of tent-cloth, drawers, shirts, slops, overalls, etc. At Saint-Omer, an important center of the industry, 19 factories out of 27 were at work.

In January 1915 the visit of American buyers gave rise to two months' activity among the Paris dressmakers, and as a consequence among embroiderers. In July 1915 a manufactory of linen embroideries at Mantes was reported to be working to its full capacity. Relief work-rooms where fine linen goods were made were doing well in the Toulouse area; they had nearly been obliged to close in 1914, but were now receiving plenty of orders. In other areas they were less prosperous. The suspension of orders for the army at the end of 1915 brought about a marked reduction of work in the production of linen goods: Paris firms were working irregularly; there was little demand for baby-linen, there being few births; and it was the same as regards men's shirts.

On the other hand a recovery was reported in the *Flemish lace* industry, where wages after falling to 0 fr. 50 and one franc a day, rose again to 2 frs. 50 and 3 frs. 50, because this lace was much esteemed by British officers. At Bailleul alone, 700 women were at work at the lace-pillows, recruited from local families or among the refugees from Malines, Ypres, and Bruges.

In 1916 business in the linen goods industry was unevenly distributed among the various districts and producers. Thus relief work-rooms had plenty of orders, but factories could not employ all their personnel, and turned their attention to the manufacture of military clothing. Some of those which worked for the export trade to the United States and Brazil went through a period of utter depression, while others had an increasing number of orders.

Some shirt-works were short of staff. The linen-works of Saint-Omer had abundant orders, but were unable either to repair or renew their sewing-machines of German make. A shirt factory, with 180 German sewing-machines, was brought almost to a standstill toward the end of the year for lack of spare parts. Certain relief work-rooms gave up linen work in favor of machine hosiery, and those in rural centers and small towns found that children were gradually ceasing to come to them, as their families kept them for work in the fields.

Export to England was stopped, and that to America much reduced; the latter country was drawing certain linen goods from factories established in the Philippines. The position of beaded embroidery makers was no less unsatisfactory; they all suffered from the lack of Bohemian beads. There was some revival in hand-made and bobbin-made lace, but the industry did not attain prosperity; young girls abandoned it because the wages were too low, and the wages could not be raised because customers would not pay more than a certain price.

In 1917 there were very few orders for linen and embroidery, and many workers had to work short hours. Export had almost ceased, as travelers were now unable to take with them all the luggage they required. The trade in expensive linen goods, however, remained fairly active, but the fabric was very dear. The growing fashion in collars and trimmings of lawn, embroidery, etc., gave plenty of work to a firm specializing in these articles. A work-room started by the municipality of Nancy at the beginning of the war, to train embroideresses and revive Lorraine embroidery by the introduction of artistic designs, was completely successful. It employed twenty workers and twenty-five apprentices and received numerous orders. At the end of 1917 linen goods and embroideries were in better demand. The personnel of some important factories in the center of France reached one-half the normal number, and one factory employed its full staff. In the south-east private and public relief institutions doing this kind of work were busier than ever; contractors had come from as far as Paris and given orders. Certain makers of Luxeuil embroidered linen had orders from America but were unable to procure fabric and thread. Embroidery on silk, an industry that had almost ceased to exist at the outset of the war, was

now very active; it was making small pocket-handkerchiefs, which were in much demand in the British and American sectors.

During 1918 this good recovery became more pronounced, but was hampered by the shortage of labor and apprentices, due to the relatively low rate of remuneration. This difficulty was particularly serious in the Lyons area, where the pre-war output had declined by 60 per cent. Raw materials had in general proved sufficient, except the machine-made embroidery of Saint-Gall, now an indispensable requirement of the linen industry, which used to be drawn before the war as much from Saint-Quentin as from Switzerland. Hand-made embroidery, on the contrary, was no longer procurable from the rural districts, so that local machine-made embroidery was everywhere much in demand.

The linen goods trade revived very remarkably after the war. There were many orders for trousseaux. One firm could have employed its full staff, but, owing to lack of raw material, had only 200 workers out of 450. Many others might have doubled their personnel, but the workers, finding the wages insufficient, although the rates had been greatly increased, gave up their jobs to become shorthand-typists and saleswomen. Nevertheless certain linen goods factories were working in normal conditions during the second half of 1919, and three had been reopened in a locality where they had been closed at the time of the bombardments.

Embroidery for new fashions was much in demand, and also for upholstery. A woman could not be got, in Paris, at 2 francs an hour to run a Cornély embroidering machine, and buyers from abroad were now occasionally making their purchases direct in the provinces.

At the end of 1919 the linen and shirt trades were, with a few exceptions, extremely prosperous, and some important firms were opening work-rooms in various parts of France. Orders were so numerous that the output was in large measure bespoke in advance. Wages were substantially increased. Fine linen goods were doing well, in spite of the high price and scarcity of linen fabric and lace; there were numerous orders for trousseaux and baby-linen. But the liquidation of American stocks seriously affected the makers of common linen goods, especially shirts.

As for the manufacture of *corsets*, exports fell in 1915 to one-

half of the normal; they recovered in 1916 and dropped again to one-third in 1917; imports decreased even more, and fell almost to nothing in 1918. Normal conditions were restored in 1919, particularly as regards the difference between exports and imports. It was naturally the expensive goods that suffered most; the ordinary article held its own fairly well at first (1915), but manufacture was increasingly hindered during the war by the extreme difficulty of procuring steels and the high price of other materials. Labor became scarcer every year; it deserted an industry where work was irregular and salaries were lower than in the munition factories. Activity was at its lowest in 1917 and 1918, and really revived only at the end of 1919, and even then was affected by the fashion which tended to eliminate corsets from the articles of female attire.

The export and import of *hats* both reached their minimum in 1915, and then recovered gradually and increased year by year. But whereas exports (measured in weight) exceeded imports in 1913, the position was reversed from 1917 onward. In 1919 the weight of imports was double that of 1913, while that of exports was 56 per cent of the 1913 figure. In fact French foreign trade in this article became demoralized during the war. Naturally, owing to the number of men with the forces, the demand for men's hats (except for fezzes and sun-helmets for the troops) suffered more than that for women's and children's hats. For the same reason there was a shortage of skilled hands, and moreover dye-stuffs were frequently lacking.

Mobilization brought the factories abruptly to a standstill. At Chazelles sur Lyon, 13 out of 15 factories ceased work, while the two others worked only two days a week with half their personnel. The straw hat factories of the Caussade and Nancy districts were completely idle. A large hat factory at Romans was an exception and continued to work for the export trade with a reduced staff. The situation improved at the end of the first half of 1915. Many orders were received from England for women's straw hats, and none of the hands that had not been mobilized were unemployed. The straw hat factories of the east had few orders, but the Caussade district employed 790 hands continuously out of 1,500. There was more pronounced unemployment in the felt hat trade of the Aude,

where only 375 hands out of 1,250 found work. Near Nantes the decline of business varied from one-third to three-quarters.

In the second half of 1915 there was shortage of labor and of dyes in some places, unemployment in others. Some factories were replacing men by women; one straw hat maker had replaced the zinc hat-blocks, which were too heavy for women to handle, by blocks made of aluminium. In 1916, besides the shortage of skilled hands, of dyes, and of coal, there was a scarcity of hare's fur for felt, though there were orders, especially for women's hats, from England, South America, and the French colonies. The *felt hat* trade, being less affected by Italian competition, was as active as the supply of labor and raw materials permitted, though in some places conditions were less favorable (Nancy, where only a quarter of the normal work was being done). The output of *straw hats* for women and children was fairly good, twice that of 1915, and three-fifths of that of pre-war days. Goods were being exported to Canada, Madagascar, Morocco, England, and America. Raw material was dear and was obtained with difficulty from China and Japan. Hydrogen peroxide was scarce and furnaces were heated with wood.

In 1917, the output of men's *felt hats*, from the causes already indicated, was one-half the pre-war output; this industry had supplanted Austria as regards the supply of velvet hats to England, Denmark, Sweden, and Norway. There were still plentiful orders for women's felt hats from Bolivia, Chile, etc., which the trade was unable to complete. In the latter months a shortage of felt was experienced, as Italy was only supplying small quantities at a high price; and work became more irregular. Many makers of men's felts had undertaken the production of women's and children's hats. The *straw hat* season of 1917 was favorable, considering the impediments previously noted, which still continued; but women had had to be set to work the presses. The output was equal to that of 1916, which had been relatively good, as appears from the following statement of the total consignments dispatched by the makers on the Paris-Orleans line:

1st July 1913 to 30 June 1914	94,308 consignments
1st July 1914 to 30 June 1915	48,314 consignments
1st July 1915 to 30 June 1916	66,555 consignments
1st July 1916 to 30 June 1917	65,662 consignments

But the increase in freight rates had led to a decline in exports, and the import of indispensable materials had become extremely difficult. Manufacturers were exporting to England, to French colonies, to India, Canada, and South America. In order to avoid having to send their straw to be bleached in Switzerland, certain firms had started a company to carry out this process at home.

In 1918, the situation of the *felt hat* industry varied according to districts; the same difficulties continued, but the demand for export was maintained. The *straw hat* trade did comparatively well; exports increased but there was a shortage of Chinese straw.

During 1919 orders for *felt hats* were plentiful, but raw materials failed (woolen tassels, dyes, and lac) and the industry was affected by the slowness of railway transport; the trade is of a very seasonal character, and makers were obliged to accumulate large stocks of unsold goods which would be out of fashion the following year, with a dead loss as consequence. These difficulties still prevailed at the end of the year. The winter season was good for men's hats; less so for women's, the fashion in which had turned rather to satin and velvet. As for *straw hats*, after much inconvenience in the early months of 1919 owing to delays in the arrival of consignments of foreign straw, business was very good in various districts. Many factories had to have recourse to England for bleaching. At the end of the year the industry was adversely affected by the exchange, as nearly all its straw was imported. None the less work was abundant and orders could not be completed.

In the Paris area, the season had been an unfavorable one for makers of *hat shapes*, as American buyers had been disinclined to face the high prices. But skilled hands were returning, and a factory that had been closed during the war began work afresh with 170 workers. *Cap* factories, closed since 1914, were reopened, and new ones were started; but found the same difficulty as had prevailed during the war in procuring cloth and even labor.

Cloth shoes. Work was reported to be fairly good in manufactories of *felt shoes* at the end of 1914 (especially in the Bordeaux area), but they were suffering from the scarcity of raw material, which was previously supplied by the invaded regions. The shortage of felt was particularly noticeable in the Nancy slipper factories. The majority of the great *sandal* factories of the Basses-Pyrénées,

which usually work for the export trade, had to suspend manufacture; during 1915 the industry was employing only half its normal staff and had difficulty in finding women to make the soles.

Orders for felt shoes were very numerous at the end of 1915, but felt and leather were scarce and very dear, and felt weavers were working for the military authorities. Felt slipper makers at this period had practically no slack season, for they had received many orders for the army; but as dye-stuffs failed, white slippers were substituted for black; skilled sole hands had been gradually replaced by Spanish labor.

In 1916 there was a shortage of felt, supplies of which from England were irregular; Spanish leather was unprocurable and women's labor very scarce, because women were better paid in factories making army boots. Nevertheless customers, all French, were giving numerous orders and putting up with an inferior article. In sandal factories, where more women and Spanish workers were being employed than before the war, work was suspended at intervals for lack of materials, and it proved impossible to complete the numerous orders from abroad. At the end of 1916 the felt slipper industry passed through a period of extreme depression: exports ceased, except for slight quantities to Switzerland; raw materials could not be obtained, even abroad; and female labor was deserting to the munition factories. The sandal factories, although affected by the same troubles, were only intermittently idle and on the whole did well.

In 1917 the slipper trade felt these difficulties still more acutely; the shortage of skilled hands reduced the output of leather slippers to a quarter of the normal; minor requisites—hempen thread, cardboard, and, in particular, glue, tacks, and rivets, which were requisitioned by the army—were unobtainable. Soles were being made out of the used felt of paper factories, or out of cows' hair felt, or even out of old felt hats. There were still no exports. On the other hand, makers of sandals and rush-soled shoes benefited by the collapse of the slipper: they were in great demand in military hospitals; but the labor supply, even though supplemented from Spain, was inadequate.

At the end of 1917 the slipper trade was busy in only a few places. The scarcity of raw material was more acute than ever for

list and other slippers; and in 1918 many factories gave up making these in favor of light shoes with linen uppers. Sandal makers did little business in 1918, for lack of jute and hemp yarn.

In 1919, after the war, the want of raw materials still hampered the slipper industry, and the personnel employed was far below the pre-war numbers. Nevertheless at the end of the year small factories were being reopened or established. As for sandals, grass-soled shoes, and linen shoes, their sale benefited by the high price of leather shoes and increased in France; and manufacture showed some activity in the Pyrenees and the Toulouse area. But jute and cotton were very dear, wages and cost of production high, and the export trade had difficulty in competing with Japan.

Flowers and feathers. We may first remind the reader (Appendix XXXII) that imports of artificial flowers, which had been small before the war, ceased altogether while the war lasted; whereas exports, freed from German competition, increased in 1915 and 1916. There was a sharp depression in 1917 and 1918 and a recovery of exports in 1919. As for *feathers for trimming*, the foreign trade diminished yearly until 1918, when the weight imported was one-eighth and that exported one-quarter of the pre-war figures. There was a slight recovery in 1919. It should be noted that France imports feathers in their raw state and exports them dressed. We may infer from this preliminary review that the French feather trade suffered more from the war than the trade in artificial flowers.

By the end of 1914 and during 1915 artificial flower makers were working hard for export and hoping to supplant Germany; they were training apprentices. Fancy feathers were active, while the trade in ostrich feathers was distinctly bad. The volume of business in feathers and flowers was estimated, for the five last months of 1914, at a quarter of the normal; at a third early in 1915; at one-half at the end of June; at three-quarters from July onward. In 1916 conditions remained favorable for the flower trade, but solely on account of exports (to North and South America); dyes, alcohol, and gelatine were, however, scarce. The feather industry was less prosperous and was short of female labor.

There was depression in 1917: orders from England and the French colonies almost ceased, although here and there a factory was reported to be doing well; the fashion in France excluded flower

and feather trimmings. Small businesses closed partially or entirely, while the big houses employed their best hands only to prevent them wasting themselves on coarse work. However the feather boa trade remained flourishing and exported abroad, particularly to Spain, which used to purchase largely in Germany.

The situation and the difficulties were similar in 1918. Restrictions on import were severe in England and America. The fashion for less expensive hats, without trimmings, was spreading from France to other countries. Still, in the latter months of the year, exports revived and output attained perhaps one-half the normal.

In 1919 feathers for trimmings were in a comparatively prosperous position: wages had not increased so much as in other industries, and the public were able to buy at relatively favorable prices. The manufacture of feather boas, now rid of German competition in Spain, developed greatly after the Armistice. In artificial flowers, on the contrary, there was a shortage of skilled hands and work tended to diminish; England and America were buying models in France and reproducing them in mass. Japan, which produced tastefully and cheaply, was also proving a formidable competitor. At the end of 1919, both the flower and feather industries continued to make progress, but slowly. If the high prices are taken into account, the export of 21 million francs' worth of artificial flowers in 1919 was far from representing the same quantity as the 19 millions of 1913; the weight exported in 1919 was a third of that exported in 1913.

Makers of *fabric gloves* at Niort were unable, as early as the beginning of 1915, to meet all demands from France and other countries. In 1916 two factories were working normally and supplying French customers who had formerly obtained these gloves from Germany. One factory was producing as much as before the war and was exporting five-sixths of its output to England and America. The manufacture of leather gloves had almost entirely given place to that of the fabric gloves known as 'cotton suède,' a fabric now made on a large scale in France, which before the war was supplied by Germany. In 1917 the knitted glove industry was very prosperous, employing, as it did, principally women. German machinery was being replaced by American machinery and export was developing to such an extent that it became difficult to satisfy

French customers. These favorable conditions continued in 1918, but restrictions hindered exports to London, and Japanese competition increased on the English market. France retained a better hold on the Spanish and American markets, whose customers had formerly obtained their supplies from Germany. In 1919 depression in the leather glove trade led several firms to undertake the production of fabric gloves.

As regards *umbrellas* and *sunshades*, net exports (after deduction of imports) decreased year by year during the war; the number fell from 1 million to 130,000 in 1919. At Angers, where many women used to be employed in factories and on outwork, mobilization led to the closing of the factories; two reopened in January 1915 with a reduced staff. In the Cantal, manufacture was resumed as early as September 1914 with one-third of the former numbers. During 1915 umbrella factories, in spite of numerous orders, were producing only a third of their normal output, owing to shortage of male labor. A manufacturer at Angers was having the wood, which he used to receive ready prepared from Austria, worked up in his factory; having no skilled men for the purpose, he had taught women the trade, and he was buying in England the fabric which he used to get from the Vosges. The position improved at the end of 1915: the factories of Toulouse and Cantal increased their output from one-third to one-half the normal. Unfortunately, the shortage of raw materials—steel stems and runners which the French steel industry had henceforth difficulty in delivering—made itself felt with increasing severity. The crisis became more acute at the end of 1916; metal fittings were ordered from America and Italy, fabric from England, cane ribs and lacquered handles from Japan, cane handles from Canton. These various obstacles reduced the output. Orders from French colonies, Cyprus, and Spain had to be refused, and customers turned from France to England and Japan for supplies.

The difficulties persisted and grew worse in 1917. The expensive parasol was hardly made any longer; it could be sent only by parcel post and this involved complicated handling. Fabric was now being ordered from Bradford, but very little was obtained. Some firms found their female labor deserting them in favor of munition factories. These unfavorable conditions lasted throughout 1918. The

discharge of workmen from explosives factories after the Armistice brought labor back to many umbrella factories, but in other instances the men sought more remunerative employment.

At the end of 1919, the lack of raw materials was still keeping output very low, and some firms were producing less than half their normal quantities. The fall in the exchange prevented them from placing orders for fabric and metal frames in England; and many manufacturers confined themselves to distributing what they could produce among their best customers. They were unable to meet even the home demand.

As regards *laundries* and *dye-works* (washing and ironing of linen, cleaning and dyeing of clothes, etc.) the mobilization coincided with the dull season and there was no revival until January 1915. But the dearth of raw materials (soap, soda, starch, and coal) was severely felt throughout the war. Starch, formerly supplied by the north of France, was now obtained at a high price from America; benzene was very dear; and aniline dyes were scarce. Laundries in the northern and Nancy areas that worked for the army were busy; and steam laundries were very active, owing to the constant and increasing needs of military hospitals. Many moderate-sized laundries were closed, frequently because the manager had been mobilized.

Laundresses had little work as most of their customers had been called up. Cleaners and dyers, except such as were kept going by the military hospitals, were working generally only eight hours a day on four days a week and with half their personnel, because of the scarcity of benzene and dyes; and yet orders were plentiful. We may note that the British army had organized many large laundries.

In 1917 laundries, other than those working for the army and the hospitals, were mainly affected by the want of coal. Dyers substituted wood for coal, and dye-stuffs were their chief need. At the end of the year work had become more regular in Paris, because a regular supply of coke had been secured by the laundry association. But many workers were leaving for the munition factories; some laundries reduced their staff and others closed. On the other hand the laundries organized by the British army were developing, and there was also great activity in the Marseilles area. The dyeing industry, in spite of the continued dearth of raw materials, was

fairly busy, because the public, in view of the high price of fabrics, were having their clothes redyed.

The situation was unchanged in 1918. The laundries of the Paris region had a new cause of trouble in the exodus of their customers, and small laundries complained of the constant rise of working expenses. The dyeing trade, though it had plenty of orders, could make no progress owing to the increasing scarcity of materials.

At the beginning of 1919, laundries were busy where they could procure fuel and chemicals; their customers had returned. And it was the same with dyers. At the end of the year the laundry trade was dull: as a result of the high prices, many housewives decided to do their washing at home; and the reduction of the working day and the general adoption of the six-day working week gave the workwomen in many trades-unions leisure to do their own washing. Moreover the practice of washing fine linen at home constantly increased. There was a certain amount of unemployment and some small laundries had to close. Managers were facing the question of bringing their machinery up to date. Dyers on the contrary were very busy; as clothes were very dear, people did all they could to make them last.

Basket-work had more orders at the beginning of 1915 than it could execute for lack of labor (owing to the mobilization) and of raw material (owing to the requisition of straw). The scarcity of labor was less acute in 1916, and some factories undertook the production of fine basket-work—toy baskets, seaside requisites—of which the Germans had made a specialty; new works were even started for this purpose. Indeed the industry as a whole was busy in 1916; light boxes for packing parcels for the army were made in large quantities. Broom-factories were very active and employed disabled soldiers. But the makers of ‘bottle-straws’ for packing bottles were short of labor in various places, because the wages were low; in other parts they complained of lack of railway trucks. Conditions remained favorable in 1917. On the other hand, makers of wicker coverings for bottles could no longer procure their maize straw from Italy. And makers of bottle-straws were still hampered by the railway transport difficulty, although they had recourse to motor haulage. There was much demand for their goods from England, which formerly imported them from Holland and Germany,

but exports remained very small for lack of cargo space. A maker of raffia goods complained that his workwomen were leaving him for a neighboring arsenal, but he still retained some good Spanish hands, and managed to export consignments to Egypt, the Argentine, and Chile.

In 1918 the personnel employed in the basket industry remained the same and output continued satisfactory, in spite of the increase in the price of osiers, which were now 200 to 280 francs the quintal as compared with 50 to 75 francs in 1917. An increase was reported in the use of reeds for the manufacture of light wattles for camouflage purposes at the front and to lay under soldiers' mattresses.

In 1919 a few basket-works remained busy; those which had been working for the army now resumed their former production, but there was a scarcity of rattan and osier. The makers of bottle-straws had their premises cumbered with goods which they could not send away, and had to reduce their output; export ceased and work was scarcely one-half the pre-war normal. Makers of rush wattles to place under mattresses and of baskets for packing flowers and fruit were doing rather poorly. Few hands could be got for making wickered bottles, as the women refused to accept wages lower than they had received in munition factories.

The *esparto* industry of Mâcon benefited at first by an increase of labor and of work; this lasted until the early months of 1915, but unfortunately did not continue. Makers went on, however, producing for export until the end of 1915, so far as the dearth of dyes did not hinder manufacture. Similarly, the factories of the Dordogne making *wire-work* and *funeral wreaths* worked regularly until 1916, when they began to run short of galvanized wire and of beads and glass flowers.

In 1916 and 1917 the *esparto* industry remained fairly busy, obtaining help from female labor; but exports to Spain and Egypt, which sent numerous orders, were limited by lack of transport facilities and above all of dyes. In 1918, as skilled labor was increasingly short, manufacturers were putting women on to the heavy looms and were better able to meet demands for export. During the same years, 1916 to 1918, makers of wire-work and funeral wreaths were still hampered by the want of glass beads and galvanized wire; they were employing only 50 per cent of their staff and

their output was likewise reduced by half. Workwomen, when they had the chance, went off to munition factories.

The same conditions prevailed in 1919—abundant orders, difficulty in obtaining supplies, dearth of labor. In 1920 there was a great recrudescence of industrial activity, to be soon followed by a fresh crisis.

CHAPTER XIII

LEATHER AND SKINS

A FEW figures will serve to resume the pre-war situation of the different branches of the leather and skins industry. In the first place, as regards raw materials, French imports of raw or dried hides were considerable, 59,129 tons of heavy dry hides and 14,820 tons of light dry hides were imported in 1913, and exports of heavy hides amounted to 36,775 tons and of light hides to 26,499 tons. Raw hides, whether taken fresh from the slaughter-house or dry after lying for a time in store, were converted into leather by the tanners, after which they were dressed and softened by the curriers to render them fit for industrial use.

The commercial balance as regards dressed skins and leather was favorable to France before the war. She imported 8,340 tons and exported 14,372 tons. It will be seen that the war tended to develop and improve the output of the tanners and curriers. Among the principal finished products we may note straps and harness, the output of which was largely increased as a result of the war. In 1913 France imported 287 tons of these and exported 411 tons. The French boot and shoe trade had formerly been extremely prosperous, but owing to increasing competition and the fact that the industry was ill equipped for mass production, exports had fallen to a value of only 12,268,000 francs in 1913, while imports amounted to 27,095,000 francs. The French manufacture of gloves, on the contrary, had developed remarkably. The annual output represented a value of 93 million francs, of which the greater part came from Grenoble (35 million francs), from Millau (15 millions), and from Paris. More than 20,000 people were dependent on it, of whom more than half lived in the department of the Isère. French exports considerably exceeded imports: in 1913 exports amounted to 488 tons worth 54,690,000 francs, against imports of 50,997 dozen pairs, worth 1,096,000 francs.

The varieties of fancy leather goods are too numerous, ranging from portfolios to the many kinds of leather sheaths and cases, for the value of the trade to be estimated; but it has an artistic side on which the reputation of the French product has been built up in

other countries. The customs statistics show that imports of trunks, valises, album-covers, leather belts, and miscellaneous objects amounted in 1913 to 495 tons, and exports to 1,147 tons.

As regards skins and furs, France dressed 1,819 tons of raw skins, worth 27 million francs, apart from such skins as were obtained at home. The chief sources of imported skins were Russia, Siberia, North America, and Australia. In 1913, although France drew from her own territory only 15 per cent of the skins that she dressed and made into garments, she exported more raw skins (3,932 tons) than she imported (1,819 tons). But the skins exported had undergone various processes in her factories which sometimes doubled their value. We have seen, in the chapter on clothing, that, in 1913, French exports of worked skins (1,673 tons) somewhat exceeded the imports (1,529 tons). The fur and skin industry was very prosperous, and employed 15,000 hands, of whom 70 per cent were women; these had established the French reputation for tasteful work. The position of the industry in 1913 may be summarized as follows: the output of skins converted into garments was worth 200 million francs, of which 130 millions were consumed at home and 70 millions exported.

Appendix XXXIII shows the exports and imports during the war of the principal articles produced by the leather and skins industry. We shall presently discuss these in detail; but the charac-

TABLE 59

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	52	37
Oct., 1914	60	49
Jan., 1915	73	64
July, 1915	81	73
Jan., 1916	86	73
July, 1916	85	83
Jan., 1917	85	83
July, 1917	88	85
Jan., 1918	87	84
July, 1918	92	83
Jan., 1919	88	75

teristic features of the table as a whole are these: an increase in import of goods required by the army, manufactured or semi-manufactured—dressed hides and skins, leather articles, boots and shoes, saddlery, harness, and straps; a decrease in the imports of raw and luxury materials, raw hides and undressed skins; and a decrease in exports of luxury goods, except gloves.

The index-numbers, for this industry, of establishments at work and of personnel employed at the dates of the several inquiries were as shown in Table 59 (territory as reduced by invasion).

The returns for January 1920 relating to the whole French territory gave the following index-numbers: establishments, 91; personnel, 98. The industry was not among those—such as metallurgy, chemicals, and transport—which recovered or exceeded their pre-war activity, but is comparable in this respect with the food and clothing industries, which, like it, supply essential needs.

Tanneries and taweries. The net imports (after deducting exports) of heavy raw hides fell from 22,000 tons in 1913 to 6,000 tons in 1915, a decline that was compensated by increased imports of leather, boots, etc. Net imports of heavy hides then increased and that of finished products diminished. Finally, in 1919, the net imports of heavy hides exceeded 32,000 tons and imports of finished products increased simultaneously. As regards light hides, the net exports of which in 1913 were considerable, the commercial balance was reversed in 1916, and there was a net import which went on increasing until 1919. Starting with a net export of 11,700 tons, we arrive at a net import of 11,900 tons.

After a stoppage of a few days due to the mobilization, military orders poured into the boot factories and the animation of the latter stimulated that of the *tanneries*. Work was particularly active on the preparation of heavy hides; some tanneries had increased their staff, and labor was everywhere short of requirements. Even the tanneries of the Lille area were busy, as the military authorities had handed over to them the hides that had been hastily removed from the invaded zone. Nevertheless, owing to the shortage of staff, the tanneries of heavy hides were unable to cope with the orders for the army, although they had recourse to military labor and to young men hastily engaged and trained. Tanners feared moreover

that the stripping of bark from the oaks would not be done for lack of hands, and that tannin would in consequence run short. And indeed the stripping, which was begun late, yielded little more than a half or a third of the usual quantity. These various circumstances brought the tanneries of Saint-Saëns, and also several tanneries in the Nancy area, to a complete standstill; while work remained slow and intermittent about Dijon. But nearly everywhere else the personnel increased in tanneries engaged on preparing leather for the army; they nearly all had their normal, or more than their normal staff, and would have expanded further if they could have found the men. The great tanneries were enlarging their premises and there is mention of others being started. At the end of 1915 the output of the heavy leather industry (tanning and currying) was approximately normal, and entirely absorbed by the army. Civilian customers had great difficulty in obtaining supplies.

All the tanneries in 1916 were working directly or indirectly for the army, and were very busy in consequence. Many of them, to overcome the shortage of labor, were replacing their old-fashioned plant by modern and more profitable machinery; and in order to obtain this, French tanners, it was reported, had combined to establish factories to make tanning machinery. Tanners had ample supplies of tannin but were beginning to find serious difficulty in procuring raw material. The stock of raw hides available was constantly diminishing; the authorities were anxious to avoid too great a reduction of the country's live-stock, and slaughtering was restricted by a general recourse to refrigerated meat. The Government took up the question of purchasing hides from the refrigerating stations at Buenos Aires. Chrome tanners were inconvenienced by the high price of bichromate of potash and particularly of bichromate of soda, which had increased tenfold in eighteen months. But in view of the country's requirements, every means of rapid tanning was adopted, and the employment of women and children became general.

At the end of 1916, a few small tanneries, with a limited capacity of output, ran short of raw material; but the great tanning and currying establishments were increasingly active, working under the control and for the account of the State, which supplied them with the hides requisitioned at the slaughter-houses by the Commis-

sariat. Some tanneries were enlarged, and new ones were started; machinery—transporters, Decauville railways, lifts, fleshing machines—was employed to make good the dearth of labour; women, in increasing numbers, were put on to complicated jobs. An important tannery was started to treat heavy ox and cow hides from Brazil and produce special leather for soles, and this in an area where work of the kind was previously unknown.

The year 1917 was marked by the same features as the previous years, in a more pronounced form; a scarcity of coal was moreover reported, also irregularity in the arrival of bark owing to the transport crisis; in 1918 the activity of the trade was maintained, in spite of a continuance of these difficulties; the personnel employed in many areas exceeded the pre-war figures, but in the north bombardments had brought about the closing of many tanneries, and in the Paris area the personnel diminished by 2 or 3 per cent. Only one-tenth of the output was assigned to the needs of the civil population. Tanning processes went on improving, with a consequent economy of labor and increase of output.

After the war, owing to a reduction of orders, the output of tanneries declined, both for the army and for the manufacture of 'national boots'; and tanners were unable to compensate this by supplying civilian customers, because foreign hides, for lack of transport facilities, were delayed at the ports, where they deteriorated. The scarcity of skilled labor made itself felt in spite of improved machinery. At the same time, a firm employing 1,000 hands found difficulty in recovering certain foreign markets, where formerly it met with no competition. When the requisitioning of French hides ceased, the extravagant rise in the price of raw hides, which had increased tenfold and kept customers away, and the liquidation of the Commissariat's stocks, were sources of fresh trouble.

Owing to the difficulty of railway transport, some firms arranged for deliveries, sometimes at great distances, by motor lorries, and as consignments of raw hides were only accepted by the railways up to a weight of 300 kilos, the cost of each hide had to be increased by 5 francs. Tanneries nevertheless were very busy in many areas during 1919, and even, in certain places, prosperous; some employed as many hands as in 1914, others even more. Exports to

England, which the war had interrupted, revived; and chrome tanning tended increasingly to replace vegetable tanning. The use of the Fouché condenser, which expedites the drying of leather, was adopted.

The recovery of tanners and curriers in the invaded region, whose premises had been methodically sacked, began only at the end of 1919. But a serious impediment arose in the scarcity of raw hides, of which America and central Europe were carrying off the local supply; their export was accordingly prohibited by decree. Some manufacturers expressed regret that requisitions had not been maintained for a few years as a check on speculation and to secure some stability in prices: for tanning involved the prolonged manipulation of hides in the tanning-pits, and the tanner who set hides to soak immobilized a considerable capital and could not foresee whether the prices he would receive a year later would prove remunerative. All these difficulties gave rise to uneasiness and hindered production; while the smaller tanneries, confined to the old-fashioned processes, found it extremely hard to compete with the big firms, who tanned rapidly by machinery, either with chrome or tannin.

Taweries also worked mainly for the army. The tawery and fancy leather trade of Graulhet and Mazamet suffered very much in consequence, because it was unable to adapt its very light leather (except such as was chrome tanned) to the production of military articles, and also because three-fifths of the Graulhet skins used to be purchased by German and Austrian firms. This situation did not improve until the second half of 1915, when the taweries that dressed dewooled sheepskins for linings experienced an interesting revival of business with England, America, Switzerland, and the Balkans. The military authorities moreover purchased large quantities of leather for the manufacture of 'képis' and for the linings of the new steel helmets. Seven works at Graulhet, employing 218 hands against 305 before the war, had army contracts for the tanning of goatskins and sheepskins. The output of taweries doing this latter class of work was reported to have much diminished. In the Tarn, the dressing of sheepskins for cloaks, which used to employ 800 workmen, came to an end in February 1915. It revived subsequently, although the export of fine wools had become impossible,

but suffered severely from the scarcity of male labor for the mechanical washing of the skins, a very laborious operation.

The recovery in the taweries of Graulhet and Mazamet became more pronounced in the second half of 1915; export continued active, and the output of fancy leather goods and of lining leathers was unequal to the demand; moreover the military authorities gave further impetus to the tanning of sheepskins for cloaks. Many tawers and leather-dyers ran short of aniline dyes, which used to come from Germany, and skilled hands for dyeing and finishing were scarce. The tawery at Annonay, which prepared kid skins for gloves, was employing only one-half of its staff; but one of the chief taweries took up the preparation of sheepskin gloves which the Germans had hitherto monopolized.

Conditions remained favorable during 1916. The leather produced by the ordinary processes, which the military authorities left at the tawers' disposal, was absorbed by civilian buyers, or, if any remained, was exported. Many firms had as large a staff as in pre-war times, thanks to the employment of refugees, women, and children. In the Tarn, there was an actual shortage of labor, owing to the magnitude of the army contracts. Women and fleshing-machinery were employed everywhere to make good the lack of men. However, in the Limoges district, certain taweries that made leather for gloves were employing only half their personnel.

At the end of 1916 and in 1917, tawers were complaining of the lack of coal, and especially of chemicals—alum and orpiment, which used to come from Saxony. But some of them succeeded in themselves producing tanning agents, which gave excellent results. Chrome tanning was increasingly employed in place of vegetable tanning. The scarcity in the supply of foreign pelts was made good by the sheepskins that the military authorities returned from the front or bought in the country. But in spite of the withdrawal of some of the restrictions on the slaughter of lambs, tawers employing small skins for gloves had great difficulty in getting supplies. Nor was it easy to procure materials for the 'bath' in which the pelts were soaked. This involved, for 100 pelts, 7 kilos of wheaten flour, 2 kilos of sea-salt, 3½ kilos of alum, and the yolks of 100 eggs. Pure wheaten flour was unprocureable and rice flour was an unsatisfactory substitute.

The position of taweries at the end of 1917 was moderately good: those which treated French pelts and did the dewooling themselves found occupation; but those which treated only dewooled skins coming from Mazamet, and originally from the Argentine, found their stocks diminishing and contemplated closing. Many firms, in order to cope with their orders, were employing women on the stocking machines.

Interesting experiments were being conducted almost everywhere with a view to replacing certain tanning materials that were no longer obtainable: sulphide of sodium took the place of orpiment, and sumac and quebracho, which come from foreign countries, were replaced by guaiacum supplied by French West Africa.

The situation of taweries became more unfavorable in 1918, owing to the difficulty of obtaining pelts, flour, yolks of eggs, and chemicals. The industry at Mazamet suffered from the reduced supply of sheepskins. Dewooled sheepskins became increasingly scarce and expensive, the price of the dozen skins having risen from 12 or 13 francs in July 1914 to 40 francs. Some tawers used to buy pelts in Spain, but their import was now prohibited; or in Morocco and Algeria, where requisitions were now absorbing all available supplies.

Conditions after the war varied from place to place, according to the initiative displayed by the manufacturer or the facilities of supply that he enjoyed. One firm, which specialized in goatskin work, could not get delivery of the large stock of raw skins that it held in Spain and Algeria, and its personnel dropped from 1,450 in July 1918 to 950; another, which had plenty of orders and raw material, could not get dyes and tanning materials; a third, whose supplies were good, had no orders, because the fancy leather trade for which it worked was waiting for a fall in prices. The situation improved in the second half of 1919, and taweries did well in certain districts, particularly those dressing goatskins. The manufacture of expensive leathers was in full swing, and the opening of a factory for varnished leather is mentioned. At the end of the year the situation was as a whole satisfactory.

We have already drawn attention to the heavy imports of *boots* and *shoes* that marked the years 1915, 1916, 1917, and again 1919; although far above the normal, they did not interfere with the

activity of the home trade. By September 1914 factories were reopening and rapidly increasing their output. In January 1915 all the firms working for the army were producing large quantities of boots, gaiters, knapsacks, and ammunition-pouches. Those not working for the army, on the contrary, were far less busy than usual, though there was a tendency to recovery. The activity in the trade was maintained in 1915, but two principal causes of embarrassment soon supervened: (1) the shortage of specially skilled labor, for lack of which a part of the female staff was, in January 1915, left idle; (2) the dearth of raw material—especially leather: sole leather, laces, thread, waxed thread, twined thread, linen linings, cloth uppers, felt, buttons, hooks, eyes, nails, and tacks. Only two out of five factories in the Lille area had been able to reopen; these received their supply of leather from the military authorities. At Fougères, manufacture was stopped for two months, and in several factories output during the first half of 1915 was only one-half, one-third, or even a quarter, of the normal.

These two sources of trouble still prevailed at the end of 1915; and yet work proceeded very actively in factories supplying the army, and their staff was nearly up to pre-war numbers. Orders for the civilian public were very numerous, especially for fancy goods and expensive shoes for women. Depression was reported at Dijon, customers holding back in view of the high prices; but, in the Marseilles area, factories were employing as many hands as before the war and refusing orders. Romans was producing 90,000 pairs a month; at Nîmes, factories were working overtime on children's boots and shoes. An attempt was made to compensate the scarcity of cutters and skilled operatives by entrusting their work to women, but this reduced output. As a whole, the requirements of the civil population could not be met.

New factories were opened in 1916, some under the direct control of the War Department. Certain manufacturers, who were prohibited by the military authorities from supplying the public, had to start some of their works afresh in the name of new firms, in order to supply their civilian clientele. Labor was recruited to the utmost extent possible, and one factory was mentioned as having increased its staff fivefold. Women were widely employed in place of skilled operatives, though they lacked the necessary physical

endurance and, at first, the technical training. In certain districts employers had arranged among themselves that the few skilled hands who could shape heels and smooth out leather with the machine, and stitch welts and do 'Black' stitching of soles, should work for several firms successively the same day. Most manufacturers were having outwork done by men and especially by women.

But leather frequently ran short, so that output in consequence often fell 30 per cent or even 50 per cent below normal. Manufacturers endeavored to export; and a maker of high-class shoes obtained numerous orders in Italy which were formerly reserved for German firms. Makers of sheepskin slippers were doing extremely well, in spite of the dearth of raw materials, and were exporting. Clog-makers were equally prosperous, in spite of the scarcity of skilled hands, who asked high wages, and of leather and wooden soles; their success was due to the high price of leather shoes. Clog-making was frequently a home industry, but some clog-makers employed 20, 30, or 50 hands in their shops, mainly women and children.

Trade showed a similar activity in 1917; there was the same civil and military demand, and the same dearth of materials, chiefly of leather, which the army was requisitioning. Factories had to close in certain districts for lack of labor, but this was the exception. In the Limoges area, 34 factories were employing 2,430 women out of a total personnel of 4,756, as compared with 1,624 out of 3,454 before the war. New factories were being started and others were improving their machinery.

The output of clogs and sheepskin slippers, though proceeding vigorously, was still below demand. Sheepskins for the latter were beginning to run short. One firm was employing goatskins split; others found their output declining perceptibly as compared with 1916; and many took to making boots. As regards clogs, the Commissariat began in the middle of 1917 to requisition the 'offal' and inferior leathers employed in their manufacture, in order to assign them henceforth to 'national boots.'

We may observe that at the end of 1917 many boot factories were engaged on 'national boots' and received the necessary materials from the Commissariat. The margin of profit allowed by the Commissariat was considered very narrow by manufacturers doing

mass production, and inadequate by those making the expensive qualities. Nevertheless the 'national boot' scheme, while it was advantageous to the customer, allowed many manufacturers as well as the retailers to make a certain profit. The application of the six-day week to women had involved its extension to men, and this was said to have caused a decline of 15 per cent in output (resulting in a fresh increase of price). A rearrangement of the work was under consideration.

Boot and shoe factories were busier than ever in 1918, and the demand for 'national boots' exceeded the supply. Works which had been closed were reopened and new works started, in spite of the persistent lack of raw materials and skilled labor, and the obstacles in the way of forwarding goods, which was done laboriously by parcel post. The making of boots to order had ceased, from want of leather.

This activity did not diminish after the war, largely in consequence of the demand for 'national boots' for the liberated districts; great quantities of boots, however, were imported in 1919 to meet the heavy civilian demand, in preference to making them out of imported leather, for which an exorbitant price was asked. But there was a correspondingly active revival of exports. Labor proved frequently of indifferent quality, because the production of carefully made boots had been neglected. The employment of women was none the less continued, as it had given good results. Many factories had been started or enlarged during the war; in an important manufacturing center the staff employed had exactly doubled. And yet new factories were still being opened and old factories everywhere extended, in spite of the price of leather. The introduction of machinery giving a high output, which had made some progress during the war, was still proceeding; and manufacturers were complaining in 1919 that the arrival of machinery and spare parts ordered in America was delayed, and that production was hindered in consequence. At the end of 1919 conditions in this trade were exceptionally favorable.

The manufacture of clogs, which had somewhat slackened in 1917 and 1918 for lack of materials, became very active in 1919, although the price of this article had increased by 400 per cent. The manufacture of sheepskin slippers, notwithstanding abundant orders,

was threatened with disaster at the end of the year by the want of materials, and the workers employed in the industry were leaving it.

There was a heavy increase during the war in the imports of *fancy leather* goods, followed by a return in 1919 to the 1913 level; unfortunately exports, which had decreased year by year, showed little recovery in 1919. A large balance of exports in 1913 was replaced by a slight balance of imports in 1919. Work, which had been checked by the mobilization in July 1914, was only slowly resumed. In January 1915 the output of such articles of current use as purses, pocket-books, and card-cases was scarcely a quarter of the normal; but it increased during the following months and works were reopened. It was reported in July 1915 that even shops making expensive articles were reopening, and this tendency became more pronounced at the end of the year. Considerable quantities were exported to England and North and South America, but there was a shortage of clasps. Some firms were increasing the hours of work to eleven and twelve a day. The Dijon area, which had at first shown little activity, became very busy, there being a good demand for articles of current use since Germany had ceased supplying them.

In 1916 fancy leather goods, although benefited by the disappearance of the German article (portfolios, purses, etc.), showed a tendency to slacken, because the manufacture of bags had been started in England. Some firms had to refuse orders because of the shortage of leather or other raw materials. In 1917 conditions in the trade were about normal; a firm that used to employ 119 hands before the war, after dropping to 23 in August 1914, had 134 in the first half of 1917, and was exporting office requisites to Switzerland, Spain, and England, and supplanting German goods. The leather sheath and case trade was short of skilled hands.

In 1918 the fancy leather goods trade saw a falling off in its business, and its female staff was being drawn off to the munition factories. After the war, makers of leather hat-linings were affected by the stoppage of work in the skin-dressing trade, which was not getting its supplies from Australia and America. Their exports to America, which were satisfactory before the war, were now checked because America had herself developed the manufacture of these articles during the war. The price of skins for these special leathers

had risen from 80 or 90 francs a dozen in 1914 to 240 francs, and there was moreover an import duty in America of 80 francs a dozen; so that competition had become impossible.

The *glove* trade enjoyed very favorable conditions during the war. The quantities imported had in 1917 fallen to one-half those imported in 1914. Exports on the contrary had been well maintained and did not decline until 1918 and 1919 (see Appendix XXXIII). By the end of 1914 the Millau glove industry had secured approximately the normal output that it was accustomed to export to America, and the personnel employed at the beginning of 1915 reached three-fifths of the peace-time numbers. But there was a scarcity of cutters for gloves. For the same reason the manufacturers of the Lyons area, who had very numerous orders from abroad, had to give up furnishing work to an important section of the inhabitants of Grenoble. The glove trade in this region was carried on before the war by fifty firms, who employed ten to twelve thousand persons in their workshops or on outwork.

Conditions in the industry were favorable during 1915, thanks to American orders. Though the supply available for the home market was reduced to one-third, the volume of exports to America continued satisfactory and brought in 300,000 gold francs a month. The trade would have been as busy as before the war, had it not been that the dearth of dyes and especially the scarcity of cutters entailed the idleness or only partial employment of the workwomen. The latter obstacle was due not only to the calling up of the professional cutters, but also to the unduly strict conditions imposed by the glovers' trades-union on the training of apprentices. An important glove factory of the Cantal, which was working exclusively for the United States and whose personnel had increased since the outbreak of war, started shops for apprentices in several localities, where young people from 14 to 17 were trained in glove-cutting.

The above features became more pronounced in 1916. The war had been a source of much advantage to the glove industry in that it had eliminated German competition. England and America, which used to obtain the most expensive qualities and certain costly specialties (antelope or mocha gloves, and velvet finish gloves) from Austria and Germany, were now giving their preference to French makers, who had appreciably more orders than before the war; 75

per cent of the output was going to England and America. To meet the dearth of professional workmen, master-glovers were trying to alter the method of manufacture, and instead of entrusting the cutting entirely to men, were applying what was known as the 'system,' based on the subdivision of work, which allowed two of the three cutting processes to be carried out by women. This method had given good results at Grenoble, as was borne out by the statistics of the American consulate in that town, where all invoices of consignments to the United States were viséd: these showed exports to the value of 3,618,000 francs in the last quarter of 1916 against 2,715,000 francs in the corresponding quarter of 1913. The same proportion was to be found in the exports of gloves at the same period to Canada, England, and the other importing countries—Italy and Spain. It was mentioned at the end of 1916 that the 'system' had been introduced into a factory in another area, with the result that workwomen formerly employed in silk-mills were earning 4 or 5 francs a day, rates previously unheard of.

The output in 1916, taken as a whole, for export and home market, reached three-fourths of the output obtained in peace-time; that of the last quarter was actually equal to the pre-war output, and yet it was less than the demand. The dearth of raw material at times brought factories to a stop, for sheepskins were being requisitioned to make trench cloaks. The chamois leather industry was even more affected than the glove trade by the scarcity of men, because the smoothing, the coloring, and especially the paring of the skins require extremely skilled labor. But in spite of these difficulties the figure of exports was maintained.

The situation was the same in 1917. France was making all the varieties of gloves that Germany and Austria used to export, even the gloves of still-born lamb's skin that were much sought after in the United States and of which Germany had made a specialty. In spite of opposition on the part of the male operatives, the 'system' was coming into general use, especially in the country districts; the employment of women was spreading and they were being put on to the mechanical paring of skins. There were still cutters in the towns, and these were earning very high wages. A business employing 300 hands is mentioned in the reports as having doubled its staff during the war, increased its machinery by 20 per cent, and

acquired a dyeing plant. But activity was reduced in some areas by shortage of skins and skilled labor, or by difficulties of export. At the end of 1917 the position of the glove industry became less favorable, because raw material had become very scarce, because the price of a dozen of gloves had risen from 27 francs before the war to 90 francs, and because the volume of exports had diminished. Since the United States entered the war, their orders had diminished by 50 per cent, while they had increased the import duty on gloves. Nevertheless the glove industry remained one of the chief sources of prosperity, in the Grenoble district among others.

In 1918 depression became acute. The Italian Government had placed an embargo on kidskins, which ceased to enter France from that country; those from America and Arabia were much delayed in transit and rotted in the ports on the way; Spain, after negotiations, allowed the export of skins that had actually been paid for, but retained those which had been bought but not yet paid for. French skins were the only ones that makers were sure of obtaining, and of these there was a scarcity. England and the United States had much reduced their purchases of luxuries, and Italian competition, profiting by low wages and helped by the exchange, was becoming active.

The withdrawal of restrictions on imports at the end of the first half of 1919 allowed glove factories to get their supplies more easily, but prices remained high, and an article that was sold formerly at 28 francs the dozen was now worth from 180 to 300 francs; light skins were almost unprocurable. The future of the industry was uncertain, reported the Labor Inspector; no doubt factories had plenty of orders, but as regards the best qualities, which were chiefly for export, the high prices had the effect of restricting demand and encouraging competition. Exports to America and England had greatly diminished, and Italian and German firms were keenly competing for those markets. The situation remained uneasy during the following months: lambskins were scarce, and labor was being drawn away by higher wages; hands were lacking for sewing and especially for stitching, processes which require a long apprenticeship. One factory had 4,000 dozen pairs of gloves in stock which it could not get finished. Export, however, revived in certain areas, being facilitated by the exchange, and became con-

siderable. America and England took the whole output of a manufacturing center in the west. As a whole, the future remained uncertain at the end of the year.

Glove-makers were in some cases buying raw skins, which they got dressed by tawers working to order; this involved the sinking of a large amount of capital which might be imperiled by a fall in the price. In other cases they bought ready dressed skins; but tawers were distributing these among the glovers in proportion to the extent of their pre-war business, and it might be that the quality of the skins allotted did not correspond with the glover's requirements. There were other sources of perplexity: wages were 332 per cent above the pre-war rate. The fear that they would rise still further, or that, as a result of a fall in the exchange, foreigners would no longer find it profitable to buy in France, prevented the stabilizing of prices and hindered transactions.

The volume of business done at home by the *saddlery* and *harness-making* trades before the war was not large, and heavy imports occurred in 1915 and 1916 to meet the large requirements of the army. By the beginning of 1915 the factories were reported to be working to their full capacity. In the Calais area their demand on the labor supply was very great. Works established at Tarbes for the manufacture of saddles and pads for the cavalry were already employing 500 hands, were draining all the local labor, and were calling for Spanish workmen. Saddlers and harness-makers were reported at the end of 1916 to have been extremely busy and to have employed a large number of women. A few firms were exporting, but the smaller men were losing their skilled hands and were short of the special black leathers, which had been requisitioned. Work remained very plentiful in 1917, but to these troubles was added a dearth of metal buckles for the various fittings. In the latter part of the year orders for the army diminished, but conditions remained favourable because, as the result of an agreement between the Ministries of War and Agriculture, harness-makers obtained certain supplies of leather that they needed for agricultural harness. Exports were dull owing to scarcity of freight.

Work continued regular during 1918, and after the war the harness-makers finished their last orders for the army and then turned their attention to the needs of the public.

Pelts for furs. We have seen that France exported in 1913 twice the weight of raw pelts that she imported, and that the exports were in a more advanced state of manufacture than the imports. The latter declined by two-thirds during the war (see Appendix XXXIII), for they corresponded in the main to an expensive quality of furs. Exports held their ground better and varied between a half and three-quarters of the normal. We shall here make only a few brief remarks on the subject and refer the reader to what we have already said on dressed furs in the chapter on the Clothing Industry.

The fact that exports were relatively well sustained secured the continuance of a certain measure of prosperity to the skin-dressing industry, and in particular to the dyeing and finishing of rabbit-skins; the closing of the Russian market at the end of 1917 was a somewhat severe blow, for which the efforts made to extend the market in America and especially in the Argentine afforded an inadequate compensation. On the other hand, French manufacturers developed the dressing of expensive pelts (common furs), which used to be done in Germany and Austria.

In fine, the preparation of pelts for fur was as active, thanks both to exports and the home demand, as was possible having regard to the shortage of aniline chlorohydrate, of quebracho, etc., and to all the troubles in connection with requisitions, transport, labor, and so forth.

At the end of 1919 peltry works were doing very well, particularly those dressing rabbit-skins for fur, as cheap furs were in great demand; and these prosperous conditions were not affected by the price of the raw rabbit-skins, which was as high as 45 francs the kilo.

CHAPTER XIV

WOOD-WORKING

THE resources of France and of its colonies in respect to wood form the subject of a special volume in this series, from which we shall borrow a few figures to complete our picture of the wood-working industries. We shall further indicate the quantities of timber annually consumed by those industries. It may also be mentioned that the construction of aeroplanes has been dealt with in a special monograph.

The forests of France covered before the war 18.7 per cent of the territory, or about 24,715,000 acres, the yield of which in normal times, in 1913 for instance, including trees planted along the roads and hedgerow timber, amounted to 25,304,000 cubic meters. Of this latter quantity, 17,392,000 cubic meters were firewood, and the balance, 7,912,000 cubic meters, was timber. There was thus roughly a total of eight million cubic meters of timber, divisible under two main heads: about 4,400,000 cubic meters of sawn timber (for building, carpentry, matches, etc.) and 3,600,000 cubic meters of pit-props, sleepers, wood-paving, telegraph posts, and billets for wood-pulp.

As regards the foreign trade of France in 1913, the following are the figures of imports and exports, excluding woodwork and materials utilized by factories (furniture, cooperage, etc.), exotic woods, wood-pulp, firewood, and charcoal.

	<i>Imports</i> <i>tons</i>	<i>Exports</i> <i>tons</i>
Constructional timber	Oak 48,982	36,231
	Walnut 13,120	7,933
	Other woods 1,481,135	227,927
Other common timber	466,666	1,008,024
<i>Total</i>	<hr/> 2,009,903	<hr/> 1,280,115

French imports of constructional and other common timber thus exceeded exports by about 730,000 tons. To compare the above figures of tonnage with the preceding figures, they must be converted into cubic meters of unhewn timber, and the deficit of 730,-

000 tons may be estimated to be equivalent to about 2,616,000 cubic meters of the latter. But this figure does not represent the country's total deficit in wood, for the imports of wood-pulp for paper-making (see Chapter IX) must be added; these in 1913 amounted to 464,948 tons, against only 654 tons exported. Hence arose a further deficit equivalent to about 1,487,000 cubic meters of wood. The total excess of imports over exports amounted accordingly in 1913 to 4,103,000 cubic meters of common timber. From this it may be concluded that the quantity *consumed* in 1913 was 12,015,000 cubic meters of unhewn timber, of which the excess of imports supplied a little more than 4 million cubic meters, and local production the remaining 8 millions.

As regards firewood, on the contrary, France produced, in 1913, 17,392,000 cubic meters and exported 92,595 tons in logs, fagots, and charcoal, while imports amounted to only 23,053 tons; so that there was an excess of exports of 69,542 tons. Leaving however firewood aside, we see that France had before the war a heavy debit balance to pay in respect of wood, arising chiefly from the well-known insufficiency of large oaks, light timber, and wood-pulp.

The invasion of part of the territory by the enemy aggravated this unfavorable situation. The region so occupied in the spring of 1917 comprised 600,000 acres of forest, while 860,000 acres of wood were included in the fighting zone.¹ The judicious exploitation, however, of the forests behind the lines proved extremely serviceable during the war, without causing them permanent damage. But if the increase in imports, which this reduction of home resources entailed, was to be checked, larger quantities should have been drawn from the French colonies, which are rich in forests.

The numerous industries working wood were, in 1913, variously situated. One of the most important, the trade in furniture and miscellaneous woodwork, was exporting 118,809 tons, valued at 53,111,580 francs, against 29,348 tons of imports, valued at 28,774,269 francs; the weight of exports was four times, and the

¹ According to an official publication of 1920, the area rendered incapable of growing wood may be estimated at 500,000 acres, and the area where forests had been wastefully or injuriously managed at 375,000 acres. These 875,000 acres will yield no timber for 60 years. Moreover, all poplar plantations and trees along roads and canals may be considered as destroyed.

value 1.8 times, that of imports. The furniture trade had a world-wide reputation, but its resources are difficult to estimate, because it is dispersed among even the tiniest villages where joiners are to be found. In Paris alone, where it occupies a whole quarter, it employs more than 20,000 cabinet-makers, wood-carvers, and other craftsmen. Its appliances however were old-fashioned and inadequate. It suffered during the war chiefly from lack of special woods and from this insufficiency of equipment. It was the same with saw-mills and parquetry. Constructional carpentry, although it employed 239,099 workmen in 1906, exported very little before the war. The carriage-builders', wagon-builders', and wheelwrights' trade had found a fruitful source of work in motor development, and it offered an excellent outlet for French colonial timber. Coopers had exported, in 1913, 17 million francs' worth of empty barrels, but these had mainly been manufactured from imported staves. The toy trade was important, but being a home industry, distributed among a very large number of workers, its situation is difficult to appreciate. Its output has however been calculated at a value of 40 million francs, while a French consul has estimated that of Germany, with its manufacture centred at Nuremberg, at 625 millions. French imports of toys, games, sporting requisites, with or without mechanism, and other similar articles, amounted in 1913 to 2,450 tons, and exports to 8,226 tons. The manufacture of children's toys, dolls' heads in particular, had made great progress.

Lastly, the cork industry was an important one before the war. Various regions in the south of France produced cork—the Var, the Landes, and Corsica, and the total production was 113,050 tons, distributed over numerous factories. Algeria yielded 16,000 tons and Morocco had vast forests for exploitation. Exports and imports of cork, raw, scraped, or in sheets, were in 1913 approximately equal in amount, and were as follows:

<i>Imports</i>		<i>Exports</i>	
Tonnage	12,318 tons	Tonnage	12,131 tons
Value	6,159,000 francs	Value	6,005,000 francs

As regards corks and other articles made of cork, the figures were these:

<i>Imports</i>		<i>Exports</i>	
Tonnage	1,879 tons	Tonnage	1,046 tons
Value	10,618,045 francs	Value	6,909,540 francs

The principal effects of the war here were to give rise to great difficulties in the matter of labor for collecting the bark, and completely to disorganize its transport.

Appendix XXXIV summarizes the position, in respect of foreign trade during the war, of the various wood-working industries and of their supplies of raw materials. A striking feature in this table is the decline of imports of common timber at a time when they were so urgently needed. From 2 million tons in 1913, imports dropped to one million tons in 1916, and 300,000 in 1918. They rose again to about 1,300,000 tons in 1920. All categories of timber participated in this decline, and particularly constructional timber, which fell from more than 1,500,000 tons to 300,000; split wood, laths, and poles dropped from 150,000 tons to 1,800 tons. Exports declined to a less extent, especially as regards wood of this last category; of this France exported 900,000 tons before the war and continued during the war to export 500,000 or 600,000 tons (pit-props, mainly to England). The total exports, which exceeded 1,300,000 tons in 1913, dropped to a minimum of 560,000 tons in 1918, and recovered in 1920 to 1,300,000, approximately the level of the imports. In short, whereas France had in 1913 a net import of 700,000 tons, she had in 1918 a net export of more than 200,000 tons; instead of drawing on foreign countries, she now did the reverse.

The figures relating to worked wood show on the other hand that imports increased considerably, while exports suffered a heavy decline, for France was unable to meet her greatly increased requirements. The reader will do well to refer to the Appendix in respect of each of the industries discussed below.

Table 60 shows, for the wood-working industries as a whole, the index-numbers of establishments at work and of personnel employed at the dates of the several enquiries during the war.

The returns for January 1920, which relate to the entire French territory, give the following index-numbers: for establishments, 91; for personnel, 81.

The wood-working industry, taken as a whole, was one of those which the war tried most severely, and its activity fell very low after the mobilization. It recovered continuously as the war went on, and finally reached the third place, after metallurgy and chemi-

cals, in the list of comparative activity; work for the army and especially the manufacture of ammunition chests and aeroplane parts brought about a progressive improvement, which disappeared at the Armistice. The industry suffered chiefly from shortage of wood and of labor.

TABLE 60

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	32	21
Oct., 1914	34	26
Jan., 1915	49	39
July, 1915	57	49
Jan., 1916	66	60
July, 1916	73	71
Jan., 1917	76	68
July, 1917	80	84
Jan., 1918	82	88
July, 1918	86	93
Jan., 1919	80	82

We shall first consider the sub-group comprising saw-mills and other wood-working factories (sawing, turning, and planing) and subsidiarily the similar workshops belonging to mechanical joinery and carpentry works; and we shall then refer briefly to the sub-group of factories working for the building trade (joinery and carpentry works).

The *factories working wood by machinery* (sawing, turning, and planing) were principally engaged in peace-time in supplying the needs of the building trade, which became completely idle after the mobilization. The first signs of recovery were seen in Paris in January 1915. In other places this recovery extended to such works as were receiving orders, directly or indirectly, from the military authorities—for tent-pegs, saddle-trees, sleeping platforms, wheels and hubs, crutches, etc. During 1915 supplies of wood from the north of France failed; and local supplies could not be got out of the forests, for lack of carters and teams; there was also a shortage of woodmen. The position of the industry was precarious, for orders were far below the normal, labor was short, and many small works remained closed, to the advantage of the large factories.

According to information supplied by 33 wood-sawyers and felling contractors in the Haute-Saône, the Haute-Marne, the Doubs, and the Jura, which are among the best wooded departments of France, there still remained in the forests out of the timber sold in 1913, 43,000 cubic meters of oak, beech, ash, and fir, valued at more than 2,200,000 francs. The total value of the timber immobilized in the above departments certainly exceeded 6 million francs, without counting the 1915 timber, which likewise represented a large sum.

Many saw-mills were employing only half their pre-war staff, or even a third or a quarter; owing to shortage of labor, women were being put to run the machines; while the mills were frequently encumbered with sawn timber, owing to lack of wagons. In the last quarter of 1915 the improvement that had begun in January became suddenly more pronounced. Saw-mills, mechanical joiners working for the building trade, and even wheelwrights, had received numerous orders for the army and had taken up the manufacture of cases for shells and for various kinds of munitions, of ammunition-wagons, etc. But the need of skilled hands to run the wood-working machinery—band and circular saws, planing and smoothing machines—made itself acutely felt. Use was made of refugees, Belgians, sometimes of children under 16, which led to accidents; and, for forest work, of German prisoners. Some saw-mills remained closed.

Conditions remained the same in 1916: while the smaller joiners, carpenters, and cabinet-makers who worked for the building and furniture trades had practically no work, nearly all saw-mills and manufacturing joiners had contracts with the military authorities.

The Military Engineering Service (miscellaneous works), the Explosives Service, and the Artillery and Munitions services, were everywhere ordering carpentry and joinery work for new buildings, cases for shells, rifle-stocks, wheels and vehicles, tool-handles, tent-pegs, sawn wood, and sleepers for the Engineers, pit-props, propellers and packing-cases for aeroplanes; also various kinds of carriages, for conveying tools and machine-guns, and bodies for motor lorries; and military hutments. Naval dockyards got to work again on rafts for the navy. But all this activity was faced by two great obstacles.

The first was the shortage of wood, which frequently brought

saw-mills to a standstill. Wherever there was wood in abundance, work proceeded energetically. In the well-wooded departments, the wood-working industries developed considerably and placed themselves at the service of the army. The felling of wood was organized on a larger scale at the end of 1916, thanks to the measures taken by the Government to centralize the wood-working trades, measures whose co-ordination in the Central Wood Office and whose extension in the following years have been described in a special volume of this series. Nevertheless the difficulty of getting supplies to the saw-mills was not overcome, because of the abiding shortage of drivers, teams, and wagons.

The second great difficulty was the scarcity of labor: what was available was either too old or too young, in general too inexperienced, for instance in the use of machine-tools, and not robust enough for certain kinds of work, such as the handling of heavy timber, which could not be done by women. Women however were being recruited everywhere, for nailing, screwing, finishing, and painting; they were even employed on machines, and generally without any falling off in output. Children under 16 were likewise being engaged. As the construction of huts employed a very large number of workmen, new labor-saving methods were adopted, such as the Col system, in which the roof timbers are of pine-wood merely barked without being squared, put together without notching, the joints being made by means of iron plates, straps, and bolts. There were also orders from private customers. Turneries and other works were unable, for lack of male labor, to cope with the many orders from America and England.

Saw-mills and other wood-working factories continued during 1917 producing the same articles for the army to their full capacity and doing little for private customers. Labor was still scarce and the employment of women and children on every class of work increased more and more. But the repair of machine-tools presented great difficulty, as skilled hands for the purpose were wanting. Some works were reopened and others were constructed, and arrangements were made for supplying the needs of aviation. Small works undertook the manufacture of detached parts. Some saw-mills, already busily occupied for the army, started turneries and made handles for tools for the Engineers. Certain master-joiners

devised a practical arrangement of band-saws which tripled or quadrupled the output of these machines in the production of brackets for shell boxes. Contrivances were adopted for facilitating the handling of weights by women. But the provision of timber was a very troublesome matter, especially for such saw-mills as worked foreign woods, for the supply of these had ceased; and many of them contemplated closing when their existing stocks should be used up.

The consumption of wood was enormous. Traveling saw-mills, practically in all parts of the country, went into the hearts of the forests to get the timber. But facilities for transporting it to the factories were everywhere lacking. Export was only concerned with pit-props for England, and this remained normal, thanks to the precautions taken by the British Admiralty.

The activity increased even further in 1918, in which year the personnel employed reached its maximum as a result of the measures of organization adopted by the Central Wood Office, which supplemented the diminishing imports by exploiting to the utmost the home forests. The difficulties of transport had not abated—submarine campaign, congested railways, dearth of horses and motor lorries. Carters at Marseilles were asking 40 francs per horse per day. Labor, driven from the north by the bombardments, had flowed toward the center and to the American establishments in the south and west. Workshops were being constructed as near as possible to the spots where timber was felled. Saw-mills continued to give all their output to the army—joists, planks, ammunition cases, hutments, pit-props, and sleepers—and many were so disposed as to be readily removable from one place to another. New saw-mills and extensions were reported in the Jura, the Alps, Brittany, Normandy, and the east. In the Landes there was hardly a station without a siding for some wood factory or other; but the requisitioning of mules was here a source of much inconvenience, as no other animal could be used on the sandy paths of the Landes forest.

The termination of the war wrought a profound change in the position of the wood industries, by bringing to an end the orders for the army, except as regards a little work for the Engineers. There was, on the whole, a pronounced setback. The great factories sought new outlets in many directions: the liberated districts in

particular called for work on hutments, carpenters' and joiners' work, doors and windows, telephone call-rooms, tables and chairs, and above all rough suites of furniture, for which numerous orders were given by private individuals and by the Ministry of Industrial Reconstruction. Other factories, in consequence of the development of the automobile industry, made motor car bodies, or repaired lorries. The repair of railway trucks was undertaken more or less everywhere; one important firm that used to make huts was now employing 1,200 workmen on the repair of railway rolling-stock. In all these branches output would have been considerable but for the shortage of timber: whole forests had been devastated by too drastic felling; and beech had risen from 25 or 30 francs the cubic meter to 125 francs. Foreign timber could be profitably employed in place of white wood, but walnut was extremely scarce.

Now that the Central Wood Office had finished its war work, there was a demand for decontrol. Female labor had in a large measure been discharged, but many employers intended to take women on again for work not requiring great muscular strength. Male labor was in much demand. There were still complaints of the lack of railway trucks, of the scarcity of powerful teams, and of the bad state of the roads.

During 1919 the new lines of manufacture developed, in spite of the difficulties previously noted, and saw-mills were very busy. The number of traveling saw-mills had increased in Normandy, and in the south they had settled in the high valleys; in the two Savoys the daily output in cubic meters was twice that of 1914. Saw-mills had started afresh in the devastated regions with such resources as they could get together. Motor tractors and motor lorries were frequently employed in place of carter's. At the end of the year the wood-working industries, which had been greatly developed by the war, were extremely active in spite of the difficulties of transport, and were making hutments in large quantities for the liberated areas; everywhere there were new saw-mills in course of construction, or old ones being enlarged.

The manufacture of *packing-cases* during this period followed in every branch the vicissitudes of production and of trade. It suffered from the prevailing troubles; it revived in 1915, improved in 1916, maintained its position in 1917, and was as active in 1918

as the difficulties of supply permitted. The export of certain articles diminished, that of others increased. The trade in trunks and traveling requisites was patronized by the army and, according to the Labor Inspector at Toulouse, by the numerous foreign workmen employed in munition factories, especially by the Annamites. In 1919, after the Armistice, this branch of industry was hampered by the lack of wood and of tools, and above all by the irregularity of railway transport; factories were frequently congested with goods which had been sold and were awaiting conveyance.

The wood industries that worked for the building trade, *joinery* and *carpentry*, came to a stop at the mobilization, and private building work did little to stimulate their activity during the war. The construction of the metallurgical and other factories that had to be built did not provide them with their normal quantity of work. The big firms equipped with machinery undertook, like the saw-mills, constructional works for the Engineers (sheds and hutments) and other work for the army (sleeping platforms, rifle butts, ammunition boxes, propellers, and packing-cases for aeroplanes, other packing-cases, tent-pegs, motor bodies, etc.). Their activity was therefore, at each period of the war, the same as we have already described when dealing with the saw-mills; their difficulties in respect of labor, transport, and supplies were identical, and we need not return to the subject. The smaller workshops did not experience the same progressive improvement, except such as were able to make detached parts, and they had little more work than the flow of repairs provided. We need only mention that many important firms were reported in 1916 as abandoning the manufacture of furniture, of veneer, of piano-cases, and of perambulators, to take up orders for ammunition boxes; that although stagnation continued in 1917 in all those branches of the wood-working industry which related to building, there was a stream of work on the construction or enlargement of munition factories; and that a few large joinery firms undertook the manufacture of a stock of doors and windows for the restoration of the devastated area.

In 1918 joinery and carpentry, apart from the construction and removal of munition factories and the usual work for the army, derived a considerable impetus from the new aviation programs in course of execution. New factories were started in most districts.

In the Paris region in particular, although a few firms had removed a portion of their works to the provinces, there was a very pronounced development. Certain firms rapidly doubled their staff and had as many as 400 or 500 hands, including many women. An aeroplane factory, established in a brickworks, was able, almost from the start, to employ 200 workwomen; and another increased its personnel in six months from 300 to 700 hands. After the war, the aeroplane factories completed their orders and then had only a reduced amount of work. In the Paris area, where this industry occupied the first place among the wood-working industries, subcontractors making aeroplane parts—propellers, wings, ailerons—suffered an abrupt check; and these men, small joiners with mechanical equipment for building work, found employment again only when the latter revived in 1920.

The building trade did not recover immediately after the war, and army contracts came to an end. Such outlets as there were, construction of hutments, portable houses, doors, and windows, furniture, were in the liberated zone—as was the case with the previous sub-group, which did the same class of work. These outlets were abundant, but there were the same impediments, scarcity of timber, of saw-blades, nails, and wire. Imports of deal from the north and of pitch-pine had not yet, by the middle of 1919, returned to their pre-war level. Labor also was short, for workmen were attracted by the high wages prevailing in the liberated region. It may be noted that firms in the Lyons area were overwhelmed with orders for stands for the Lyons fair; also that at the end of 1919 works previously engaged on aviation material were doing mass production of common furniture, household utensils, and wooden toys.

True building work did not revive, or only slowly; this was partly due to the rent restriction laws. And yet the dearth of housing accommodation was severely felt, for five years had elapsed without the erection of new civilian dwellings.

Cabinet-making was brought to a complete standstill at the mobilization: all the furniture dealers of the faubourg Saint-Antoine in Paris closed their doors, and a slight revival in October was merely due to the completion of a few outstanding orders. Ninety-five per cent of the workshops were closed in January 1915; the remainder were making ammunition chests or working for aviation.

Trade with America, Italy, and Spain was stopped; indeed Appendix XXXIV shows that foreign trade in furniture—exports and to an even greater extent imports—fell very low during the war, to a total of 1,170 tons in 1918 against 17,400 in 1913.

There was a slight recovery in the Drôme in 1915, but at the end of that year the situation was no better. Not only were orders scarce but the price of copper and of wood had increased, and there were no exports. Certain furniture makers modified their processes so as to work for national defense, and engaged female hands. However, a few chair factories received orders, but had difficulty in executing them for lack of wood and male labor; one had lost two-thirds of its staff, but another in the Nancy area had resumed work with half its numbers, who were employed ten hours a day.

In 1916, although orders were still few, the staff reduced, and many firms idle, a recovery was reported in the manufacture of cheap furniture, high-class chairs, and office and shop fittings. At the end of the year, orders in a few places were more than the available cabinet-makers could deal with. Some factories were employing women on pumicing; a firm making gilded fillets for frames was doing well. But, in general, the situation remained precarious. There was a lack of coal, of alcohol, and of labor, and, in particular, the transport difficulty greatly complicated deliveries, especially abroad, so that these were reduced as a whole to one-fifth of the normal. The workshops of the faubourg Saint-Antoine had reopened but were only vegetating; and many were idle in other places.

There was still much unemployment during 1917. Nevertheless there was a more pronounced revival in the furniture trade, especially as regards cheap deal furniture, and rustic articles (garden seats), for which there was a large demand for hospitals, and which were made by women and children. Mass production was beginning with a view to the restoration of the liberated areas; and there were even a few orders for expensive furniture. Many firms had adapted their factories to supply the army with elogs, ammunition chests, etc.

The trade in expensive furniture, wood-carving, and gilding, was short of walnut and beech, and had to replace these by elm, plane, and chestnut. But frame makers still had plenty of work. Turners

were not busy; those supplying cabinet-makers were short of lac and especially of alcohol for varnish. A manufacturer of office furniture had been able to increase his staff, between 1916 and 1917, from 80 to 160, as a result of the disappearance of German competition on his markets.

The revival referred to above did not become general at the end of 1917, though certain localities were still busy. Many firms in Paris took to aeroplane work. A large factory had closed at Lyons for want of wood; but overtime had had to be worked in Brittany. Manufacturers of wooden ornaments, frames, and trunks were unable to get metal fittings, such as hinges, screws, and locks.

During 1918 the furniture trade received important orders for the invaded districts, for hospitals, and for America, especially orders for common furniture; but had difficulty in carrying them out, as seasoned timber and, above all, skilled labor were deficient. Moreover, since July 1917, railway consignments might not exceed 50 kilos weight for single pieces, and 150 kilos for crates; and in order to keep within these narrow limits manufacturers arranged to dispatch by road the furniture they sold. A few workshops had kept themselves going by making light furniture, bazaar goods, in deal: the majority by adapting themselves, like the joiners and carpenters, to the requirements of national defense, and making, in many instances, aeroplane parts.

A marked recovery in the furniture trade was at last reported after the Armistice, and this became general at the end of the first half of 1919. In spite of prices two to four times as high as before the war, the orders for the liberated regions and for private customers were in many localities beyond the capacity of manufacturers. Expensive furniture, in particular, was in demand in the Paris area, and its manufacture revived in many places. There was everywhere a shortage of skilled hands, and many factories were still working with only half their normal personnel. The recruiting of Spanish workmen was helpful, but proceeded slowly. There was no longer a scarcity of wood, but marble and looking-glass were short. Certain firms that used to work for the Air Service were now engaged on the mass production of furniture. Work was abundant at the end of 1919 in the furniture and cabinet-making trades, but

was far from equaling demand, owing to deficiency of supplies and of skilled labor.

The *saddle-tree* factories of the Tarn saw their personnel increase, within six months of the mobilization, from 210 to 315 hands. Then, after a period of overwhelming activity, which lasted until the end of 1916, they were suddenly brought to a stop, as orders for the army dropped to insignificant dimensions. These factories, which used to export largely before the war, especially to South America, but had now lost their clientele, endeavored at this juncture to adapt themselves to new kinds of production: ammunition chests, ammunition and store wagons, and even, in spite of numerous difficulties, railway wagons. The depression was somewhat alleviated toward the end of 1917 by a certain number of orders; in 1918 and until the Armistice, the American army, in its turn, gave abundant work to factories. In 1920 the saddle-tree trade had almost entirely disappeared. One of the largest firms, having lost its place in the English and American markets, was now making wheelbarrows for the liberated districts; another was to an increasing extent making railway wagons and parts of rolling-stock and of agricultural machinery.

Carriage building and wheelwright's work. The import of carriage work greatly developed during the war, while exports shrank nearly to nothing, and the year 1919 brought little improvement. The country consumed all that it could produce, and demand exceeded the home supply. What follows only refers in a subsidiary measure to vehicles for railways; the latter come rather under the head of mechanical construction and the railway industry, to be dealt with in subsequent chapters. The imports of wheelwright's work, which is grouped with carpenter's work in the Customs returns, also increased remarkably, while exports declined even more.

After the mobilization, the industries connected with carriage building and wheelwright's work fell into complete stagnation, except *motor car body building*. This stagnation lasted for a long time, during which only repair work was done. Then, at the end of 1916, Inspectors reported that, owing to the vast amount of carriage transport, wheelwrights' shops had recovered much of their activity, and mentioned some that had largely increased their staff, even though they were not engaged on national defense work. At

the end of 1917, wheelwrights were still doing a few jobs for private customers, while busily manufacturing ammunition carts and wagons; but labor was short, as it was likewise in the carriage building trade, which was doing little but work for the army. During 1918 carriage builders, wheelmakers, and wheelwrights were busy on national defense work, and as all their output was reserved for the army, there were no exports. There was a scarcity of iron, both bars and plates, and of machine-tools. The want of male labor was also felt, for as most of the work was arduous, men could not be replaced by women. Nevertheless some important works, with mechanical equipment, were started in the Pyrenees. The opening of factories for the production of transport material—wagons, lorries, tractors—is worthy of note.

After the war, work was resumed for the civilian public. Motor car body building developed in several centers, but it was checked in 1919 by the selling off of military cars and lorries, and, moreover, some large motor firms started building their own bodies. However the autumn exhibition stimulated manufacture, which was active at the end of the year.

In 1919 wheelwrights and carriage builders were overwhelmed with work for the agricultural industry; and there was a very marked recovery during the same year in the construction and repair of railway wagons, which provided work for many firms previously employed on army contracts. But there was still a shortage of skilled workers in these trades, especially in the provinces; likewise of wood, of iron for tires, and of coal. The use of machinery was developing.

The position of shipwrights and ship repairers (wooden ships) was at first unfavorable, like that of other wood-workers, in spite of repair work and a few other contracts for the navy. During 1917 construction and repair of *river vessels* showed a satisfactory degree of activity, limited however by the dearth of carpenters. Later, at the end of the same year, this activity was reported as good, the supply of labor, which was insufficient to keep the canal boats in repair, having been reinforced by military workmen exempted for employment under the Roads and Bridges administration. A dockyard had specialized on the construction of life-saving rafts for the navy. In Brittany, two large firms had bought up a

certain number of unemployed dockyards and were busy building ships. Others were increasing their staff, which was already up to the pre-war level.

Appendix XXXIV shows that the imports of wooden ships assumed large dimensions in 1917, while exports remained very low. This recourse to foreign supplies, due to France's heavy requirements, became more pronounced in 1918 (11 times the pre-war tonnage).

Boat-builders were very active during the first half of 1918: the staff of one yard increased from 392 to 497 hands; and various firms, whose yards had been closed for years, started work afresh, employing such labor as they could pick up, or prisoners of war. This activity was maintained after the war: wooden boats were built to be equipped with petrol motors, and the construction and repair of river boats were also pushed on hurriedly. The trade was still busier at the end of the first half of 1919, and would have been even more so had more skilled labor been available. An unsuccessful attempt was made to introduce Italian carpenters and calkers. The country's requirements were so great that imports of wooden boats reached 22 times the tonnage imported in 1913.

Manufactories of *tools* and *tool-handles* show no very striking variation in respect of their foreign trade, although, in consequence of the country's requirements and of the difficulties of production, exports declined far more than imports (Appendix XXXIV). Work in rural factories was irregular and in most places scanty in 1915 and 1916, and when orders for agricultural implements became abundant they could not be carried out. Trade was somewhat more regular in 1917, but hampered by lack of raw material, and of transport; there were many orders for pickets, carriage-poles, and ladders, for the army. After the war, tool-handle factories set themselves energetically to work on arrears of civilian orders.

Walking-stick makers, who employ home-grown woods, worked normally during the war, especially in 1918. Makers of *umbrella* and *parasol handles*, on the contrary, being dependent on Eastern woods, did a reduced trade.

As regards *wooden shoes*, *clog-soles*, and *wooden heels*, it will be observed that imports of wooden shoes, which had been insignificant in 1913, increased during the war, while exports diminished; which

shows that the home output was insufficient to meet requirements. Factories were not, in fact, very active down to the end of 1917, owing to the scarcity of wood and of skilled labor, and in spite of very numerous orders. It was reported that at the end of 1916 many clog factories were partially idle, and that wooden shoe factories, which have a special need of skilled labor, were in many places doing only a quarter of their normal work. Output in 1917 remained far below demand; but manufactories of wooden soles developed greatly, thanks to orders from the Commissariat, and their development continued in 1918 when wood was once more plentiful.

The great extension in the manufacture of clogs and wooden shoes which took place after 1917 was maintained when the war terminated owing to the very high price of leather boots and shoes. Machinery nearly everywhere replaced hand-work, and as men, particularly skilled workmen, remained scarce, women and children were employed. A wooden shoe factory was started with improved machinery, which gave employment to 30 disabled men. In spite of the lack of wood and of varnished leather, and the difficulty of transport, at the end of 1919, the manufacture of clogs and wooden heels developed still further, and labor was easily obtained for it. One factory brought its machinery up to date and purchased 32 lathes; and new factories were started.

It should be noted that the manufacture of *orthopædic articles* and wooden legs was very active during the war, notably from 1916 onward. After the war these factories, which had large orders from the Health Department, were short of skilled labor.

As regards *wooden pipe* factories, it was reported that of 13 firms employing 1,283 hands in the district of Saint-Claude, all were at work again in July 1915 and employing a staff of 920. At the end of that year they were as busy as the supply of male labor would allow; there were plenty of orders, and three-quarters of the output went to England and the British colonies, the remainder to France, principally to the Commissariat. To maintain the supply of blocks (pieces of briar root sawn roughly into the shape of pipes), manufacturers had petitioned that their export should be prohibited; they had difficulty in procuring them in the following years—they come from the south of France, Corsica, Sardinia, and Algeria.

The Saint-Claude factories were very busy at the end of 1916

but could not cope with demand; 16 factories were now employing 1,857 hands as compared with 2,305 before the war. Manufacturers were altering their machinery in order to be able to employ women and children. It appeared from an inquiry conducted by the Syndical Chamber of Saint-Claude that the daily output was about 350 gross, and that net salaries were 4 frs. 70 for women engaged on polishing, 4 frs. 65 for those on working up the pipes, and 8 frs. 30 for men engaged on shaping them; as this last class of work was suitable for disabled men, a school had been started for the purpose of training them.

In 1919, after the war, the output of Saint-Claude pipes was about equal to the demand, which had declined a little in face of the high prices. Exports to England, Switzerland, Belgium, and Holland were maintained.

Manufactories of *combs*, of wood and horn, were reported to be working in 1915 with a staff reduced by one-half in the Lavelanet district (Ariège). Orders, especially for export (to Italy, Egypt, and South America), would have provided work on the peace-time scale for the whole staff, if sufficient skilled hands had been available. In the Rouen area many comb factories were still idle at the end of 1915; others had started again with only one-third of their staff. This industry therefore suffered much from the war. There was little change in 1916. It would appear that the disappearance of German competition facilitated export and the sale of stocks in France; but the annual output of the Ariège factories dropped from 12,903,000 combs before the war to 6,645,000 in 1916. There was especially a shortage of horn workers, whose work regulated the whole manufacture, and whose number was reduced by half.

In 1917 the activity of the trade, which was still kept up by the orders, was still only one-half of the normal, for want of sufficient resources; and the situation remained similar in 1918. The manufacture of celluloid combs (at Oyonnax), according to the reports, had steadily decreased, owing to the absence of raw materials.

Exports, which had been 25 per cent of the pre-war figures, were now very much reduced, both because manufacturers preferred to supply French customers first, as they paid cash, and also because sea-transport was difficult. The German horn comb, sold at a very low price, did not compete successfully with the French article,

which was preferred for its better finish; but the German ebonite comb was gradually becoming as much sought after as the French horn comb. A French firm attempted the manufacture of these ebonite combs.

There was a considerable recovery in the comb industries, after the war, in Normandy and at Oyonnax. The supply of celluloid continued unsatisfactory, but that of gallalith became normal. Manufactories of box-wood combs, which were in general busy in 1919, had to reduce their output, owing to the difficulty of sending consignments to the East; and horn comb factories would have had a great deal of work if supplies had arrived with more regularity. There were reports also of shortage of labor, as its tendency was to flow toward industries requiring no apprenticeship, whence a reduction of exports to Switzerland, Italy, and Austria in 1920.

Coopers suffered constantly during the war from the scarcity, (1) of stave-wood: imports of it (from Russia, Austria, and Italy) fell from 79,000 tons in 1913 to 7,000 tons in 1918, and only recovered to 33,000 tons in 1919; while exports, except in 1918, remained at their normal level; on the other hand French chestnut wood (especially barrel-hoops) was scarce and dear; (2) of hoop-irons; and (3) of skilled workmen; mobilization had spared only old or very young workmen, and cooperage is a difficult trade, needing a long apprenticeship. Barrels were in consequence scarce and dear, while the demand, especially for casking wine, was great. (It will also be seen from Appendix XXXIV that imports of barrels, of no great importance in any case, declined from 1913 to 1918, while exports, which were more considerable, maintained their level until 1917; these facts harmonize with what has been said above.)

We shall have little to add to these general remarks on what was a permanent characteristic of the industry. The manufacture of casks for cement came to an end in 1915, because the Engineering Service of the army decided that cement should be delivered in sacks instead of casks. On the other hand, the Explosives Service ordered barrels for the packing of gun-cotton. The manufacture of casks for the carriage of sea fish depended, as in the past, on the abundance of the catches.

After a period of comparative prosperity in 1915, work diminished in coopers' sheds in 1916 as a result of the difficulties above

described, and by the end of that year the reduction had reached 50 per cent. This continued in 1917, in spite of the large number of orders, and many coopers were henceforth reduced to making buckets and pails for the army. At the end of 1917 women who had been engaged by coopers were reported to be leaving them for munition factories. In 1918 there was little activity in the trade; in the south-east it was working mainly for the army; in the Charentes work had dwindled since the Government had prohibited the export of brandy; in other parts orders were refused because there were no means of carrying them out.

In 1919 the cooperage industry resumed production by machinery in certain districts of the south; elsewhere it had little work to do other than the repair of half-hogshead casks for wine and of oil barrels; in the Bordeaux area there was still a shortage of labor and of staves, which impeded the export of wine and brandy.

As regards the manufacture of *corks*, we should first note that the net imports of raw cork somewhat increased: in 1913 imports and exports balanced at 12,000 tons; in 1918 4,000 tons were imported while only 1,500 tons were exported. As for manufactured corks, the net import in 1913 of 900 tons declined during the war to 250 tons, a matter of no great consequence.

Conditions varied in 1915 according to districts and seasons, but the recovery was perceptible; some difficulty was experienced at the end of the year in transporting Algerian cork-bark from the port of Cette in Lot-et-Garonne. Orders were few in 1916 and raw material hard to obtain. Exports to England and North and South America nearly ceased at the end of that year. The stagnation increased in 1917 and an important center that used to produce 50 million corks now only made 10 millions. The competition of metal caps and porcelain and rubber stoppers was becoming serious. At the end of the year a slight improvement was reported in the delivery of supplies, in orders, and in exports. Nevertheless the position, with local exceptions, remained very unsatisfactory in 1918: there was a shortage of railway-trucks, exports had ceased, the Lot-et-Garonne factories, where 4,000 men were employed, were thinking of closing, and labor, tired of the irregularity of the work, was abandoning the industry.

After the war, the output remained far below the normal level

owing to lack of hands, and Spanish competition made itself felt abroad. The industry, it was said, ought to be completely remodeled, and improved machinery giving a large output ought to be adopted, so as both to make good the shortage of labor and to secure for such workers as remained in the factories a wage at least equal to that which could be earned in other occupations. In 1920 a few manufacturers did install machinery and so solve the labor problem.

Manufactories of *brushes, boot-trees, buttons, brooms, etc.*, received plenty of orders in 1915, increased their personnel and recruited women. New factories were opened, in spite of the difficulty of procuring wood. As regards the manufacture of buttons, the position of which had been very unfavorable in 1914, there was a great recovery in 1915 due to the orders of military clothing factories, and to those of the English and South American markets.

In 1916 all factories of this class were very busy, especially such as supplied the army. Brush factories were working to their utmost capacity; one of these, which had been able to raise its staff to the pre-war numbers, was thought to be supplanting Austrian wares on the English market. But they were hampered by the dearth of wood, which used to come from the Meuse and the Ardennes. Button factories were very active and were even exporting. They were employing women on the cutting up of bone, and were taking the place of Germany in the production of bone-mounted toilet requisites. Makers of mother-of-pearl articles would have been exporting largely to England if they had not been short of skilled labor.

Brush, broom, and button factories remained very busy in 1917 and 1918 notwithstanding the scarcity of such raw materials as came from abroad, and in spite of the closing of their principal market, England, which had forbidden imports. But the whole output was easily absorbed by France, mainly for the army. Some factories were reported to be closing for lack of labor, or reducing their staff for want of raw material. Most districts, however, were flourishing, opening new works, installing machinery, and working for the army. But a factory which had been unable to get rid of its stock of brush handles owing to the transport difficulty had been obliged to close.

The manufacture of brushes developed after the Armistice, espe-

cially in Normandy; one factory, started during the war, was employing 300 hands. The recruiting of labor had become easy as a result of agreements between unions and employers fixing the rates of wages and adopting the six-day week. At the end of 1919, although this industry showed a very satisfactory activity in various regions, it was reported to be passing through a period of serious depression in a southern department where it had flourished during the war. This was attributed, not only to the usual difficulties of the moment, but to foreign competition, which was said to be offering brushes on the Paris market at the very low price of 22 francs the gross. The manufacture of mother-of-pearl buttons was affected by the competition of the Japanese, who were very expert in this form of production and alone supplied the mother-of-pearl shells.

Wooden toy factories, which were now freed from their German rivals, developed during the war, although circumstances did not admit of a substantial increase of their foreign trade. Appendix XXXIV shows that there was a great reduction in the imports of children's toys and sporting requisites, from 2,450 tons in 1913 to 445 tons in 1918; while exports declined from 8,226 tons in 1913 to 2,838 tons in 1918.

In 1916, however, wooden toy factories were busy and could not cope with all their orders; a few new works were started. A depression was reported in 1917; then, at the end of the year, carved wooden toys found increasing favor with the public. But labor was insufficient for the manufacture of these various articles, as it was, likewise, for dolls and animals made of cloth. Workshops were opened for disabled men; one of these grew in importance after the war and had numerous orders.

As regards wooden *musical instruments*, the imports of these were, in 1913, less than the exports; imports of pianos fell to nothing by 1915, and also in 1917 and 1918; and exports also decreased, dropping progressively to one-fifth of their former value in 1918.

Some recovery in manufacture was reported by 1915. For example, the musical instrument factory at Mirecourt was employing one-third of its staff at the end of the year in spite of the shortage of labor and of Austrian wood; one manufacturer took up the production of cheap violins, a German article; the harmonium factory at Andelys was employing two-thirds of its usual numbers (includ-

ing many women). But orders were scarce; there were a few exports to England and America. In 1916, the mitigation of import prohibitions in England allowed a few more pianos to be sent there, but wood and copper were deficient. In 1917 very little work was being done for the home market, and little for England, though work for America was more regular; and the situation became worse in 1918. There was some revival of exports in 1919, imports remaining at a low level.

CHAPTER XV

METALLURGY AND WORKING OF ORDINARY METALS

THE rôle of metallurgy and of the great engineering industries was an important one during the war, largely in consequence of the orders given by the Ministry of Munitions. They form the subject of a special volume in the *Economic History of the War*, to which readers desirous of full information regarding their active and prosperous career during the war may be referred; we shall confine ourselves to information of a general and summary character.

We give to begin with the usual table showing, in regard to these industries, the number of establishments at work and of personnel employed at the dates of the successive inquiries by the Inspectors of Labor. It brings to light the rapid and formidable increase in the personnel employed on metallurgical construction during the war, which reached its maximum in the first half of 1917 and then declined a little, both in consequence of military requirements, which made it necessary to recall men who had been provisionally exempted; and as a result of the difficulties of supply caused by the submarine campaign. The numbers employed, which at their maximum exceeded by 67 per cent the peace establishment, were distributed over a number of factories smaller by 10 per cent than that of pre-war period; but the factories which had closed were small ones. We should point out further that this increase in numbers was not composed only of trained operatives drawn from other industries, or foreigners and prisoners of war, but mainly of women, who joined the war factories in large numbers. (See above, Chapter II, pages 22-46.)

On the 1st January 1920, the index-numbers for the entire territory were: for establishments, 97; for personnel, 109.

The following report on the iron industry during the period 1914-1918 is taken from the 'Bulletin' of the 'Comité des Forges' dated the 2nd February 1920.

TABLE 61

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	42	33
Oct., 1914	52	43
Jan., 1915	66	63
July, 1915	73	82
Jan., 1916	79	110
July, 1916	82	135
Jan., 1917	84	159
July, 1917	88	167
Jan., 1918	89	150
July, 1918	92	
Jan., 1919	87	120

Situation of the Metallurgical Industry at the End of 1914.

Ironworks had been busy during the first seven months of 1914 and their output gave reason to suppose that the results of the year would approximate to those of 1913; but metallurgy, like other branches of national industry, was paralyzed by the mobilization. Ironworks lost, at a stroke, 67 per cent of their personnel: managers, engineers, heads of departments, and workmen, left to join the army, and management, departments, and manufacturing staff were all disorganized.

Attempts were made, with the help of the older workmen who had not been mobilized, to reconstitute a few gangs, but even in the districts furthest removed from the theater of war there were numerous blast-furnaces, steel-works, and rolling-mills that had to suspend work owing to insufficiency of staff and raw materials.

It should be added that the issue of the battles fought in the autumn of 1914 allowed the enemy to occupy, and to retain for four years, French territory comprising almost the whole of the iron-working centers of the north and east.

As compared with the figures of 1913, the country's means of production were reduced, at the end of 1914, in respect of cast iron by 64 per cent, and in respect of cast steel by 58 per cent; for metallurgical works were distributed in the following proportions between the invaded and non-invaded territory:

	<i>Cast iron</i>		<i>Steel</i>	
	<i>tons</i>	<i>per cent</i>	<i>tons</i>	<i>per cent</i>
Total output in 1913	5,207,000	100	4,687,000	100
Output of factories in invaded territory	3,336,000	64	2,719,000	58
Output of factories in remaining territory	1,871,000	36	1,968,000	42

As regards the various processes, France retained two-thirds of her means of producing open hearth steel, but only a quarter of the means of producing Martin steel; her resources in the matter of crucible and electric furnace steel were practically unimpaired. In respect to finished products, her resources were reduced as follows:

	<i>Total output in 1913</i>	<i>Output of works in non-invaded region</i>	<i>Proportion of their output to that of the whole territory</i>
	<i>tons</i>	<i>tons</i>	<i>per cent</i>
Rails	431,000	201,000	46
Steel billets	802,000	395,000	49
Girders	483,000	128,000	26
Other sections	224,000	62,000	27
Sheets and large plates	573,000	283,000	49
Rolled rods	144,000	44,000	30
Wire, drawn	72,000	58,000	80
Tires	70,000	60,000	85
Forgings	85,000	77,000	90
Tubes and pipes	62,000	2,000	3
Steel castings	102,000	43,000	42
Tin-plate	27,000	27,000	100
Springs	6,000	6,000	100
Armor-plates	30,000	30,000	100
<i>Totals</i>	<u>3,111,000</u>	<u>1,416,000</u>	

It should be observed that in this respect France suffered far more cruelly than the other principal belligerents.

Reorganization and Development of the Means of Production.

When military events had shown that the war would be a lengthy one and that stocks of munitions and of war material must be reconstituted and increased, the authorities released a number of skilled men from the army that they might return to the mines and iron-

works. This enabled twenty blast-furnaces, a quarter of those which remained available, to be started afresh by July 1915; another twenty were lit in the second half of that year, and ten were ready for service.

The resumption of work on the production of steel was pressed on with equal vigor: 97 open hearth furnaces were alight in January 1916, 15 or 20 others were ready, and 35 new furnaces were in course of construction.

Not only was every advantage taken of existing resources, so that works which, for one reason or another, had been out of action for some years, were being reopened, but a great impetus was also given from 1916 onward to the creation of new means of production. The blast-furnaces completed and brought into action during the war, and those in course of construction when hostilities ceased, represented an increased capacity of annual output of cast iron of about 590,000 tons, distributed as follows:

	<i>Tons</i>
Northern area	150,000
Western area	325,000
South-western area	65,000
South-eastern area	10,000
Central area	40,000

As for steel, the apparatus constructed and brought into operation during the war, or in course of construction when it terminated, was as follows:¹

		<i>Proportional increase per cent</i>
Martin furnaces	109	94
Thomas converters	56	114
Crucibles	1,280	105
Electric furnaces	18	75

The second column indicates the proportional increase in the number of the furnaces during the period from the end of 1914 to 1919, taking into account only such as were situated in the non-

¹ It has been thought preferable to retain the French descriptions of apparatus and steels. 'Martin furnaces' approximate to open hearth furnaces, and 'Thomas converters' to Bessemer furnaces.

invaded territory. The capacity of annual output of the above, in crude metal, was distributed as follows:

	<i>Tons</i>
Northern area	110,000
Western area	410,000
South-western area	40,000
South-eastern area	155,000
Central area	880,000
Eastern area	165,000
	<hr/>
	1,760,000

The above figures, which do not include new furnaces constructed to replace old ones, may be considered as representing what was practically a net increase in the country's capacity for steel production.

Fluctuations in Output.

Although the capacity of manufacture constantly increased as new apparatus was constructed, the actual monthly output did not progress in conformity therewith; the fluctuations in output are given in the table below:

	<i>Output in tons</i>	
	<i>Cast iron</i>	<i>Steel</i>
January 1916	90,140	136,083
April 1916	108,414	151,432
July 1916	130,347	160,219
October 1916	143,853	170,297
January 1917	144,831	199,615
April 1917	139,967	178,644
July 1917	149,354	190,160
October 1917	151,102	199,794
January 1918	111,791	166,076
April 1918	91,538	148,509
July 1918	107,510	156,212
October 1918	103,331	150,576

The month of October 1917 represents the period of greatest manufacturing activity; this activity subsequently declined, although the means of production went on steadily developing, because the use made of the available resources became increasingly

unsatisfactory. If we compare actual output with capacity of production, we get the following results:

	<i>Cast iron per cent</i>	<i>Steel per cent</i>
Year 1916	100	94
Year 1917	72	74
Year 1918	56	59

This state of things was due to the insufficiency of labor, the defective supply of fuel, and the difficulties of railway transport.

The release of skilled workmen who had been mobilized was naturally limited strictly to the most indispensable men; in order to replace their normal labor supply, blast-furnaces and steel-works were obliged to have recourse to squads of prisoners of war, or to foreign or colonial laborers, whose work, in point of quality and quantity, never came up to the requirements of the industry.

The question of the supply of metallurgical coke was particularly serious, by reason of the reduced output of the coal-fields of the Nord and the Pas-de-Calais. The submarine campaign, moreover, introduced an element of disturbance in the supply of fuel from Great Britain. Again, an industry such as metallurgy, which requires for its provisioning the carriage of a very heavy tonnage of raw material, was necessarily the first to suffer by the dearth of trucks and difficulties of transport.

*Cast Iron.*¹

Output. The total output of cast iron from 1910 to 1918 was as follows:

	<i>Tons</i>		<i>Tons</i>		<i>Tons</i>
1910	4,038,297	1914 1st half	2,448,958	1915	585,776
1911	4,470,141	1914 2nd half	241,588	1916	1,488,691
1912	4,939,194		—————	1917	1,734,967
1913	5,207,307	1914 <i>Total</i>	2,690,546	1918	1,306,494

The output by the Thomas process, which constituted, in 1913, two-thirds of the whole, was only 28 per cent of the whole in 1918.

¹ 'Cast iron' is used throughout this monograph as the nearest available equivalent of the French term 'fonte,' but the latter includes all iron containing more than 1.5 per cent of carbon; it has, that is to say, a wider meaning than the expression 'cast iron.' [Translator's note.]

There was on the contrary an important increase in the proportion of castings, and of cast iron for open hearth treatment. This was due partly to the destruction of the principal Thomas steel-works situated in the Meurthe-et-Moselle, and partly to the diversion of manufacture to meet war requirements; moreover hematite iron castings found their principal employment in the production of shells of cast steel. The casting of steel was known, but was little employed before the war.

Special mention should be made of the rapid increase in the production of synthetic castings, by the treatment of steel scrap in electric furnaces; it yielded a valuable supplement of metal for the manufacture of projectiles, while providing a use for the scrap from the factories. The process was first applied industrially at the end of the first half of 1917 and output reached nearly 7,000 tons a month by the end of the same year.

The output of iron and steel by areas was as shown in Table 62 (thousands of tons).

TABLE 62

	1913	1914 1st half	1914 2nd half	1915	1916	1917	1918
East	3,560	1,672	44	27	306	377	228
North	933	432	34	9	285	383	172
Centre	184	85	47	149	218	234	221
South-west	261	123	60	185	332	372	328
South-east	159	76	44	158	227	240	194
West	109	60	13	58	121	130	160
Total, non- invaded territory	5,206	2,448	242	586	1,489	1,736	1,303

These figures reveal the profound changes in the equilibrium of French manufacture that resulted from the occupation of the greater part of the iron-working centers of the north and the east: output in the north in 1916 and 1917 was one-third of what it had been in 1913, while the course of military events in 1918 involved a fresh disturbance of manufacture in the few factories that had remained in French hands. Output in the east was reduced to one-

tenth of what it had been before 1914. The results obtained are none the less remarkable, for these works, situated as they were near to the trenches, were for four years exposed to bombardment by artillery and aeroplanes, and yet never stopped work, thanks to the courage and self-sacrifice of all grades of the staff. The share of the east of France in the total production of iron and steel fell from 68 per cent to 20 per cent; that of the north kept at about the same level, 20 per cent.

The recovery in actual output, however, proceeded principally from the south-west, owing to the relighting of the blast-furnaces of the Gironde, and from the west, thanks to the blast-furnaces of Caen and Rouen, which were in great part constructed during the war.

Production by electric furnace, except as regards synthetic casting, was almost entirely confined to the region of the Alps, where the electro-metallurgical works driven by water-power are located. The output comprised, in particular, the items shown in Table 63.

TABLE 63

	<i>Ferro-silicon</i>	<i>Chrome-steel, ferro-molybdenum, tungsten steel, etc.</i>	<i>Other products connected with the manufacture of iron (silicospiegel, silicomanganese, etc.)</i>	<i>It may be of interest to note the following: Castings with wood fuel</i>
1913—tons	7,830	7,915	2,368	5,036
1914—tons	6,050	8,514	1,669	6,494
1915—tons	10,414	7,118	3,752	203
1916—tons	11,810	4,602	8,380	5,281
1917—tons	12,633	5,493	7,790	5,006
1918—tons	11,882	5,589	18,806	5,733

Blast-furnaces. Of the 170 blast-furnaces existing in France at the beginning of 1914, more than half (12 in the north and 78 in the east) were in territory that was invaded. These furnaces, being mainly of more recent construction and larger dimensions, represented in fact, as we have already stated, 64 per cent of the total capacity of production at the country's disposal.

The situation at different dates of such furnaces as remained available may be seen from the figures of Table 64.

TABLE 64

	<i>Furnaces</i>			<i>Total monthly output tons</i>
	<i>Alight</i>	<i>Extinguished</i>	<i>Total</i>	
January 1914	131	39	170	434,000
July 1915	20	61	81	46,000
January 1916	40	41	81	89,000
July 1916	46	38	84	135,000
January 1917	53	29	82	125,000
July 1917	56	30	86	160,000
January 1918	56	26	82	131,000
July 1918	55	32	87	102,000
January 1919	59	30	89	88,000

The reduction in monthly output from 1918 onward was due, as has been said, to difficulties of transport and the insufficient supply of raw material. At the beginning of 1919, twelve blast-furnaces were in course of construction.

Consumption of cast iron. Taking exports and imports into account and leaving aside stocks in hand, we find the consumption of cast iron to have been as shown in Table 65.

TABLE 65

	<i>1913 tons</i>	<i>1914 tons</i>	<i>1915 tons</i>
Production	5,207,000	2,689,000	584,000
Imports	50,000	22,000	175,000
<i>Totals</i>	5,257,000	2,711,000	759,000
Exports	113,000	52,000	13,000
Consumption	5,144,000	2,659,000	746,000
	<i>1916 tons</i>	<i>1917 tons</i>	<i>1918 tons</i>
Production	1,464,000	1,709,000	1,270,000
Imports	621,000	669,000	393,000
<i>Totals</i>	2,085,000	2,378,000	1,663,000
Exports	17,000	21,000	8,000
Consumption	2,068,000	2,357,000	1,655,000

*Steel.*¹

The total output of crude steel from 1910 to 1918 was as follows:

	<i>Tons</i>		<i>Tons</i>		<i>Tons</i>
1910	3,413,304	1914 1st half	2,229,509	1915	1,087,000
1911	3,837,052	1914 2nd half	357,345	1916	1,951,892
1912	4,428,514			1917	2,231,651
1913	4,686,866	1914 <i>Total</i>	2,586,854	1918	1,807,931

The output was distributed over the different qualities of steel as shown in Table 66.

TABLE 66

	<i>Thomas</i>		<i>Martin</i>		<i>Electric</i>	
	<i>Acid</i>	<i>Basic</i>	<i>furnace</i>	<i>Crucible</i>	<i>furnace</i>	
1913—tons	252,704	2,806,475	1,582,478	24,085	21,124	4,686,866
1914—tons	74,767	1,505,525	1,040,079	35,783		2,656,154
1915—tons	29,827	59,459	944,836	53,578		1,087,700
1916—tons	69,794	513,529	1,290,833	33,307	44,429	1,951,892
1917—tons	64,630	574,150	1,498,353	40,487	54,031	2,231,651
1918—tons	79,596	315,041	1,312,625	42,447	58,222	1,807,931

Reduction of output took place chiefly in Thomas steel, while open hearth steel nearly recovered to the pre-war level, and the output of crucible and electric furnace steel doubled and trebled respectively. The explanation is simple: the chief Thomas works fell into the hands of the enemy, and on the other hand munitions required almost exclusively the qualities of steel manufactured in the works of central France.

The different kinds of steel constituted the following proportions of the total output:

	<i>1913</i>	<i>1917</i>	<i>1918</i>
	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>
Thomas (acid)	5.5	2.8	4.4
Thomas (basic)	60	26	17.5
Martin	33.6	67	72.6
Crucible	0.5	1.8	2.3
Electric furnace	0.4	2.4	3.2
	100	100	100

¹ See foot-note on page 272.

The output of steel was distributed over the various regions of France as shown in Table 67 (in thousands of tons).

TABLE 67

	1913	1914 1st half	1914 2nd half	1915	1916	1917	1918
East	2,529	1,265	46	77	352	396	255
North	1,166	572	17	49	245	259	181
Centre	528	242	193	581	763	969	844
South-west	160	80	33	119	207	223	181
South-east	120	54	29	116	176	172	130
West	184	85	39	146	208	213	218
Non-invaded territory	4,687	2,298	357	1,088	1,951	2,232	1,809

The output of the eastern region thus fell by 85 to 90 per cent; that of the north, which suffered somewhat less, fell by 80 to 86 per cent. In the other areas output showed an absolute increase; it rose by 60 to 80 per cent in the Loire, and by 15 to 30 per cent in the west and south. The central region took the first place as producer of open hearth steel, and retained the lead in respect of crucible steel, of which the output grew between 1913 and 1918 from 22,000 to 36,000 tons. The south-east utilized the hydro-electrical works of the Alps to develop the production of electrical furnace steel.

Steel-works. France in 1914 had 164 Martin furnaces, 100 Thomas converters, 24 electric furnaces, and 1,253 crucibles; the occupation of the northern and eastern areas deprived her during the whole war of the use of 48 Martin furnaces, 53 Thomas converters, and 38 crucibles, thus reducing by 58 per cent, as has been said above, her means of production of crude metal. The number of furnaces available at various periods is given in Table 68.

These figures show that the number of furnaces available went on steadily increasing; we explained at an earlier stage the reasons which prevented output from following a corresponding course.

TABLE 68

	<i>Sept. 1914</i>	<i>Jan. 1916</i>	<i>July 1916</i>	<i>Jan. 1917</i>	<i>July 1917</i>	<i>Jan. 1918</i>	<i>July 1918</i>	<i>Jan. 1919</i>
Thomas converters								
In use	....	23	18	31	27	40	46	49
Not in use	....	29	34	27	47	35	44	46
<i>Total</i>	47	52	52	58	74	75	90	95
Martin furnaces								
In use	....	97	102	114	104	98	94	76
Not in use	....	27	27	26	48	64	83	108
<i>Total</i>	116	124	129	140	152	162	177	184
Crucibles								
In use	....	1,127	1,176	1,212	1,260	1,423	1,264	916
Not in use	....	88	108	198	301	325	740	1,164
<i>Total</i>	1,215	1,215	1,284	1,410	1,561	1,748	2,004	2,080
Electric furnaces								
In use	....	9	7	13	17	16	17	15
Not in use	....	4	6	5	4	13	14	16
<i>Total</i>	13	13	13	18	21	29	31	31

At the end of 1918 there were in course of construction in various steel-works:

8 Thomas converters
 41 Martin furnaces
 417 Crucibles
 11 Electric furnaces

These, added to the figures of furnaces already existing, would, when completed, place at the disposal of the French steel industry a total of

103 Thomas converters
 225 Martin furnaces
 2,497 Crucibles
 42 Electric furnaces

Finished products. Regular statistics of finished products were not compiled during the war in their usual form, under the headings of rails, girders, etc. The only figures that we have been able to procure are given in Table 69.

TABLE 69

	<i>Rails</i>	<i>Chairs, fish-plates, and sleepers</i>	<i>Girders</i>
1913—tons	.....	461,073	391,397
1914—tons	210,641	13,627	225,553
1915—tons	23,048	1,644	31,401
1916—tons	45,994	3,177	81,188
1917—tons	74,168	5,255	77,356
1918—tons	48,508	2,244	40,493

No information is available in regard to steel billets, steel sheets, and sections other than girders. The factories situated in the non-invaded territory had produced in 1913 about 50,000 tons of steel castings; this figure must have been exceeded during the war, owing to the large requirements for military purposes and the starting of several new foundries.

The manufacture of tin-plate was hampered by the scarcity of raw materials, and never rose above a monthly figure of 2,500 tons. The output of the principal makers of steel tubing was 62,200 tons in 1913, and the output for the whole country was about 80,000 tons. This industry, which was almost entirely located in the north, suffered with especial severity from the hostilities; however, thanks to new works started in the center and south of France, it managed to work up to a monthly estimated output of 3,000 tons, against a capacity of output of 15,000 tons.

The development of finished products was principally directed toward munitions of war. Advantage was taken of the special machinery and trained personnel of the works in the center of France to employ them preferably on the manufacture of war materials both for France herself and for the allied and associated nations. France provided almost the whole of the equipment of the Serbian army; she sent large numbers of rifles and machine-guns, and large quantities of heavy ordnance and munitions, to Russia, Greece, and

Roumania; and she supplied the American army with the whole of its light artillery and many batteries of heavy guns.

Whereas in 1914 it was possible with the means available to undertake daily the manufacture or repair of five 75-millimeter guns, this figure had been increased to 30 in the second half of 1916, to 36 in 1917, and still further in 1918.

The daily output of 75-millimeter shells, which, according to the programs and arrangements of the Ministry of War was, in case of mobilization, to be 10,000 a day, rose to 150,000 early in 1916, and to nearly 300,000 in May 1917. The production of shells of 155 and 220 millimeters, which hardly figured in the forecasts of war manufacture (the output was only 200 a day), rose progressively, until 1917, to 50,000 a day for the former and 30,000 for the latter.

The manufacture of heavy ordnance was not undertaken until 1916; when the Armistice was signed, there had been delivered 6,500 heavy guns, 4,500 of which were of a caliber of 155 millimeters, the balance comprising guns of 105, 220, 320, 340, and 400 millimeters. At the end of the war the country's daily output was 60 guns of various calibers.

The manufacture of rifles increased between 1914 and 1918 in the proportion of 1 to 290, of machine-guns in the proportion of 1 to 170. Finally, during the last six months of the war, 30 to 35 tanks were turned out each day.

Consumption of steel. This may be estimated at the amounts shown in Table 70, if we leave stocks in hand out of account.

TABLE 70

	<i>1913</i> <i>tons</i>	<i>1914</i> <i>tons</i>	<i>1915</i> <i>tons</i>
Production	4,687,000	2,656,000	1,088,000
Imports	364,000	257,000	1,106,000
<i>Total</i>	5,051,000	2,913,000	2,194,000
Exports	780,000	465,000	154,000
Consumption	4,271,000	2,448,000	2,040,000

	<i>1916</i> <i>tons</i>	<i>1917</i> <i>tons</i>	<i>1918</i> <i>tons</i>
Production	1,952,000	2,232,000	1,808,000
Imports	2,753,000	2,763,000	1,900,000
<i>Total</i>	4,705,000	4,995,000	3,708,000
Exports	199,000	153,000	56,000
Consumption	4,506,000	4,842,000	3,652,000

Imports and exports of the principal finished products are given in Appendix XXXV.

To complete this survey drawn up by the Comité des Forges, we will add the more distinctive figures relating to the year 1920.

As regards cast iron¹ (pig-iron, castings, Bessemer, etc.) output was in that year as follows:

	<i>Tons</i>
Cast in coke furnaces	3,253,650
Cast in charcoal furnaces	946
Cast in electric furnaces	89,818

or a total of 3,344,414 tons, against only 2,447,000 tons in 1919.

The number of blast-furnaces alight in 1920 was 97 (96 consuming coke and one chareoal) against 87 in 1919. There were in addition 70 electric furnaces (80 in 1919). The chief producing departments were the Moselle (1,369,000 tons) and the Meurthe-et-Moselle (1,048,000 tons), after which came the Pas-de-Calais, Calvados, etc.

The production of wrought iron and weld steel in 1920 was 144,000 tons, against 103,000 tons in 1919. As regards cast steel, the output in crude metal, ingots, and castings obtained on first melting from Bessemer or Thomas converters, from open hearth furnaces, and from crucibles, or electric furnaces was 2,706,279 tons against 2,156,000 tons in 1919. The chief producing departments were the Moselle (845,044 tons), the Meurthe-et-Moselle (538,000 tons), the Saône-et-Loire, the Loire, etc. The output of blooms and billets was 1,975,154 tons. The following were the quantities of certain

¹ See note on page 274.

finished products—the same as we gave above when dealing with the period of the war—with the corresponding figures for 1913:

	<i>1920</i> <i>tons</i>	<i>1913</i> <i>tons</i>
Rails, fish-plates, sleepers	173,130	431,000
Tires	36,500	70,000
Steel	746,081	802,000
Girders	138,361	483,000
Other sections	133,533	224,000
Sheets and large plates	338,010	573,000
Rolled rods	79,847	144,000
Forgings	49,739	85,000
Tubes and pipes	30,749	62,000
Steel castings	69,593	102,000
Tin-plate	21,321	27,000
Springs	4,738	6,000
Special steels	70	....
Hoop-iron	4,574	....
Armor-plate	....	30,000

One hundred sixty-seven ironworks were in action during 1920 (12 of which were in Alsace-Lorraine), and employed 100,000 workmen; but it will be seen that their output, notwithstanding the restoration of Alsace-Lorraine to France, was still far from equaling that of 1913. Summing it up, we find that the total output of the iron industry, in round figures, in 1920 and 1913, was as follows:

	<i>1920</i> <i>tons</i>	<i>1913</i> <i>tons</i>
Cast iron	3,344,000	5,207,000
Wrought iron and steel	<div> <div> wrought iron and weld steel cast steel </div> <div> 144,000 2,706,000 </div> </div>	4,687,000

Finally, the foreign trade in cast iron, wrought iron, and steel in 1920 appears from these figures:

	<i>Tons</i>
Imports	1,913,820
Exports	1,626,494
Excess of imports	287,326

The total output of the country in cast iron, crude steel, and wrought iron amounted in 1920 to:

	<i>Tons</i>
Cast iron	784,000
Wrought iron and weld steel	144,000
Steel (cast, ingots, and castings)	2,706,000
<i>Total</i>	<hr/> 3,634,000

If we add to this last figure the excess of imports over exports, 287,000 tons, we get 3,921,000 tons, which represents approximately the consumption of these metals by France in 1920, a figure very much below that of 1913, which had been 5,144,000 tons, while that of 1919 had been 4,158,000 tons. The figure for 1913 was composed as follows: home production 5,207,197 tons + imports, 48,850 — exports, 112,000 = consumption, 5,144,000 tons.

The output of metallurgical works as regards metals other than iron was as follows:

	<i>1913</i> <i>tons</i>	<i>1919</i> <i>tons</i>	<i>1920</i> <i>tons</i>
Lead	28,817	10,928	15,059
Zinc	67,890	10,800	20,058
Copper	11,968	873	1,559
Nickel	1,500	500	1,333
Manganese	. . . .	1,997	3,097
Aluminium	13,483	10,255	12,304
Arsenic	. . . .	735	606
Antimony	6,390	2,024	2,479

The foreign trade figures for 1920 were the following, and the home consumption can be deduced from them:

	<i>Imports</i> <i>tons</i>	<i>Exports</i> <i>tons</i>	<i>Consumption</i> <i>tons</i>	<i>Proportion of</i> <i>French production to</i> <i>French consumption</i> <i>per cent</i>
Lead	57,254	8,423	63,890	24
Zinc	58,775	14,347	64,513	31
Copper	82,497	51,229	32,827	0.5
Tin	6,967	2,060	4,907	. .
Nickel	2,569	238	3,691	36
Mercury	212	54	158	. .
Antimony	459	601	2,337	106
Aluminium	1,399	2,638	11,065	111

We shall supplement the above general and compendious statistics only by a few details, such as will illustrate the general course of developments, and will also serve to show how those industries fared which were of particular interest to the public. The latter are not numerous, for every factory of any importance, whose equipment made it adaptable to munition work, was enlisted for the production of war material.

Blast-furnaces and cupolas, forges, steel-works, engineering shops, engineering works, and manufactories of agricultural implements, etc., made cannon, shells, detached parts for artillery, and vehicles for troops in the field—ambulance wagons, limbers, gun-carriages, horseshoes, etc. Tin-plate and sheet-iron works even produced camp-kettles, bombs, grenades, tins for preserved meat, etc. The smaller works supplied parts of shells to central shell factories organized by the local Inspectors of Forges; the smallest available lathe worked at the turning of shells, and such as were not employed by their owners were requisitioned.

Even the early months of the war furnish numerous examples of the development of the industry, which serve to explain the results arrived at: thus a factory in the Tarn-et-Garonne which had 254 hands before the war was employing 654 in January 1915; it was exclusively making shell-cases and brass wire for making bullets; in April of the same year its staff numbered 889.

At the Creusot works the personnel dropped from 13,213 in peace-time to 11,431 in the first months of 1915, but this slight decline occurred only in departments that were not working for the army; labor in the artillery department and in the hammer and press shops had been reinforced and was working 140 hours a week, by day and night shifts.

At the end of the first half of 1915 factories treating ordinary metals were fully occupied with munitions orders and were chiefly making shells; some were running day and night, while the majority worked more than the normal hours, and the weekly rest was reduced to half a day. Large works were extending their premises and their plant; two Paris firms, which before the war employed respectively 2,800 and 6,900 hands, now had 3,800 and 8,500. In the Toulouse area the number of workmen in the 112 principal works had increased from 9,207 in July 1914 to 12,729.

By the early months of 1915 the employment of women had become a general practice. At Lyons, in the metallurgical industry, their number had risen in a few months from 3,500 to 7,000, and they were earning 6 to 8 francs a day. It was due to their assistance that many works were already able to show a larger number of hands than in peace-time.

The characteristic feature of all this activity, as pointed out by the Labor Inspector at Toulouse, was that while there was a decrease in the number of works running, there was an increase in the personnel employed. This was due to the temporary disappearance of a number of small shops, from which the plant, being of too restricted a description to yield a considerable output on the spot, had been removed to larger premises, where a more rational and, above all, a more productive organization of manufacture could be adopted. The personnel followed the machinery and thus became collected in large shops where many hands were employed together. Contracts were generally made by the State with the great firms, and these employed the smaller works as sub-contractors to supply detached pieces or shells in the rough.

In regions near the front, however, it had not been possible to organize manufacture with the same rapidity. In the Lille area, at the beginning of 1915, blast-furnaces were still extinguished, and ironworks were operating on a very limited scale; the steel-works at Outreau (Calais area) and the great metallurgical factories of the valleys of the Moselle and the Meurthe were still idle.

It should also be noted that as all the available labor was employed on munition work, other factories were short of hands and orders from civilian customers were not being executed.

The activity of the trade increased further during the second half of 1915. The forges and rolling-mills of Creil had trebled their output of horseshoes, and were preparing to quintuple it with the help of female labor. The naval steel-works at Saint-Chamond were employing 12,000 hands (including 2,700 women) at the end of 1915, in lieu of their normal 3,000. The numbers employed in the Toulouse area had risen from 13,070 to 17,890. In the Paris area, in October 1915, the number exceeded the normal, and yet there was a shortage of labor. Many works had doubled or trebled their per-

sonnel, and small shops that employed a few hands in peace-time now had more than 100.

Factories that had been closed since the outbreak of war were resuming work, and new undertakings were constantly being started. The conversion is mentioned of a glass bottle factory into a foundry, and the adaptation of the former premises of the Lyons exhibition to workshops for the manufacture of shells and fuses, where 6,000 hands, including 2,000 women, were engaged. Toward the end of 1915 the only metallurgical works reported to be still idle were in the neighborhood of the front.

But these increases in the labor strength, this exceptional influx of workmen into certain districts, had not been effected without giving rise to serious housing difficulties; and factory owners had to put up huts, dormitories, and dining-halls. Further, if the quantity of labor had increased, its quality had declined. Foundry managers were constantly asking for molders, engineering firms were always short of skilled turners and fitters, although the Labor Department kept supplying men of this description.

Women were being employed to an increasing extent to run small machines, which they learnt to manage in a few hours (drilling, countersinking, etc.), or in a few days (lathes). In the Nancy area 266 women were employed in foundries, on extracting castings from the molds and cleaning off the sand, an innovation which tended to spread.

In 1916 this overflowing activity gave rise to remarkable increases in the numbers employed. In the Paris area the number of establishments at work was only 2,132 or 67 per cent of the pre-war figure; but the number of workmen and workwomen recorded in the first half of 1916 was 145,000 or 125 per cent of the normal personnel. And the progress had been regular and rapid: 61,000 in January 1915; 93,757 in July; 130,189 in January 1916; 144,032 in April. The staff of some establishments had trebled, and an instance is mentioned where, for 2,750 hands before the war, there were now 8,350. In the Toulouse area, the 624 works comprised in the inquiry used before the war to employ 12,855 hands, and had 18,040 in the first months of 1916. There are even more striking examples: the working population of two localities in the south-west had increased from 800 to 2,600, and from 258 to 3,200, respec-

tively. The staff of one factory had, in three months, grown from 32 to 350 workwomen. Numerous similar instances can be quoted.

Women were being entrusted with work of increasing difficulty, and new machinery suitable for them was being devised; their training was being done in ten days. And this movement was going on in all the areas. There was extraordinary emulation between the male and female workers, and interesting facts with regard to the output of female labor were observed in certain factories: "The output in quantity, especially where the handling of heavy pieces is involved, is always less, varying between 60 and 80 per cent of that of adult men. But the output in quality is better, and is frequently superior to that of male labor. In certain mechanical operations (drilling, countersinking, turning), and in certain delicate operations (molding and finishing of certain parts), the women do more careful work than the men."

It should be noted likewise that attention was being paid to the employment of disabled men, and also that recourse was still had, in 1916, to a large number of colonial and foreign workmen: Annamites, Kabyles, Spaniards, Belgians, Greeks, Italians, Serbians, and Chinese, the quality of whose work was, of course, unequal.

But the endeavor to increase production was not confined to efforts to secure a larger labor supply: there was, throughout 1916, a constant improvement in machinery; measures were taken with a view to getting the maximum advantage from the labor of women and from the unskilled labor which had to be resorted to. Mention is made, in the reports, of the scientific organization of work, notably on the Taylor system; wages were increased and hours of work were better arranged. Thanks, moreover, to the use of machine-tools, output grew during this period of organization more rapidly than did the number of operatives: certain works which in December 1915 turned out 800 75-millimeter shells a day with 500 hands, were producing in the second half of 1916, with 650 hands, 15 155-millimeter breech-blocks a week, besides 3,200 75-millimeter and 600 155-millimeter shells a day. Among interesting innovations we may note the following: steel scrap from the lathes on which projectiles were turned, which hitherto had not been utilized, and remained in stock, could now, by means of electric furnaces, be founded afresh;

unemployed glass-furnaces were adapted to the manufacture of special shells; new sources of water-power were brought into use; etc.

The position of factories working for civilian customers and for export was a little improved in 1916; but they lacked either raw material or facilities for its conveyance. Orders, however, were plentiful. Foreign customers were calling for various things: Spain, for instance, for bolts, chains, and ironmongery; Tunisia, for screws and bolts; Switzerland, for watch-keys; the Argentine, for carriage-brakes, saws, tools, pitchforks, coffee-mills, etc. But the exports of many articles barely reached one-third of the pre-war quantities. The majority of the orders of French civilian customers remained completely hung up, whether for the manufacture and repair of agricultural implements, of bread-machines, of factory plant, of heating apparatus, or of farriers' appliances. Manufacturers who desired to set up machinery or increase their plant in order to cope with the numerous orders in hand were obliged to turn to foreign sources of supply—to America, for instance, for the various machine-tools. Makers of apparatus for the wine industry were able to increase their machinery appreciably in 1916, in order to meet a large number of orders from America. A recently patented machine for pounding coal-dust, and charging and uncharging coke-ovens, met with considerable success in France and abroad, and superseded the German devices.

In 1917 the chief characteristics of the course of the industry remained the same, but we should note a very important development of the use of water-power. In spite of intense activity in general, some relaxation was at first reported in the work of certain minor establishments: a few small manufacturers of *gâines*,¹ shells, and grenades were unable to renew their contracts; certain works were abandoned, and others were grouped in large units equipped with improved machinery. The calling up of the younger classes created new gaps in the personnel. Some firms had been discharging workmen and workwomen and reducing the hours of work. Certain other lines of manufacture, on the contrary, had become more active—as for instance the production of aero-engines—and

¹ *Gâine*: steel receptacle screwed into the nose of the French high explosive shell. This is filled with explosive and fitted with a detonator, which is exploded by a percussion cap. *Encyclopædia Britannica*. [Translator's note.]

had attracted the labor thus rendered available. It may be said that at the end of 1917 munition factories were employing all the labor that they could recruit. But all this development of existing works did not check the starting of numerous fresh enterprises. We may note only a few of these:¹ a factory employing 215 hands on the treatment of zinc ore; another washing, sorting, and extracting the tin from brass scrap, hitherto a German industry. A new factory was treating electrolytic copper and producing special shells; a dam was in course of construction which would supply it with the 1,500 h.p. it needed; a metallurgical centre, whose first blast-furnace was lit on the 19th August 1917, was, a few months later, employing 4,000 workmen.

But the most important improvement effected was the construction of powerful electro-metallurgical factories. Two such had already in 1917 started work in the Aude and the Ariège, and were producing synthetic castings; another in the Haute-Garonne was producing zinc; four waterfalls were being adapted to furnish 30,000 h.p. to two factories for the production of synthetic castings and cyanamide, which were nearing completion; an important scheme for the diversion of the Haute-Garonne, calculated to yield 12 to 15,000 h.p., was under examination.

Mention should be made of the situation, in 1917, of factories working for private customers. They had a large number of orders in hand, but could not carry them out for want of labor and of raw materials. We find instances of this in the manufacture of machinery for breweries, and of large machine-tools (a factory that had previously been making 155-millimeter shells took up the production of the latter in 1917). Small manufacturers of scales were almost entirely at a standstill, for lack of labor, and in spite of very numerous orders, particularly for steelyards, received from France, America, and Saigon.

Most firms confined themselves to repairing articles for the public, without being able to produce new ones. Makers of wheelbarrows and agricultural implements were short of ironmongery; makers of scissors, files, and knives were short of screws and special steels.

¹ See above, pages 276 and 280, for new blast-furnaces and steel-works brought into operation each year.

Certain works engaged on the manufacture of shells also did repairs for civilian customers.

In 1918 the metallurgical industries continued to flourish, but some falling off was observed as compared with the preceding six months: although the number of establishments at work had again slightly increased almost everywhere, the total number of workmen employed had diminished for various reasons: the calling up of young classes, the withdrawal from the factories of mobilized men and occasionally of colonials; moreover certain orders for the army were on a lower scale, and munition contracts were smaller. Military events had disturbed certain areas: in the north and east, heavy bombardments by aeroplanes and long range guns had caused a migration of personnel, and manufacturers were removing their works to a greater distance. Some munition makers in Paris had decided to establish themselves provisionally in the country, and the removal of these industries had increased the activity of the areas to which they had withdrawn. There were instances where employers had been obliged to discharge part of their staff, to suspend night shifts, and reduce working hours. The staff of three large foundries had been reduced by half as compared with the maximum figures of 1917, and 550 women had been discharged. The numbers employed by one firm had dropped from 4,000 to 2,000.

But these relapses were only exceptions in what was in general a prosperous situation. The check to the manufacture of certain categories of ordnance was compensated by the production of aero-engines, magnetos, tanks, rolling-stock, etc. In less than three years a great metallurgical firm had constructed an aero-engine factory in the department of the Rhône in which 18,000 hands were employed; and another factory, though still in course of construction, had 3,000 men at work building tanks, and was increasing its staff every month.

The manufacture of aluminium was being actively developed and a large amount of power was available for electro-metallurgical works. The opening of new factories is still mentioned in the reports, and among these we may refer to several foundries for the production of synthetic castings and ferro-silicon. Finally preparations developed in 1918 for post-war reconstruction and for the adoption

in this connection of new lines of manufacture, and the Inspectors draw attention to numerous instances of the kind.

It was natural that after the war the suspension of military orders should retard, and in some cases completely arrest, the progress of the metallurgical industries. During the months that followed the Armistice labor was being discharged everywhere, and the personnel employed in works would drop from 5,000 to 2,000, or from 4,500 to 1,200. Some factories were idle, and some were closed. The reductions of staff in general affected the women first, even before current contracts were completed; but before long the demobilization of certain classes and the departure from the factories of men provisionally exempted from service, the release of prisoners of war, and the exodus of foreign workmen, also contributed to bring about a reduction of personnel in the great works; and it frequently happened, in 1919, that factories were short of labor.

The transition of the war factories to peace conditions presented real difficulty. Such as had existed before the war resumed their former lines of manufacture with the advantage in some, indeed in many instances, of having acquired new machinery. But those which had been specially constructed for the purposes of the war had to transform themselves completely, alter their machinery, find customers, and build up a commercial service. These difficulties were aggravated by the disorganization of the railways, by the lack of raw materials, and frequently by the cautious attitude of customers who were reckoning on a fall in prices. Some firms adopted an expectant policy, and watched the experiments of their rivals.

However, as we have mentioned, many manufacturers had not waited for the Armistice to prepare a new line of action, and we may give, by way of example, some of the general information supplied by the Labor Inspectors at the beginning of 1919. In several areas energies were now directed to the production of motor cars, agricultural machinery, motor traction for agriculture, machine-tools, and transport material, all of them departments in which demand was likely to be considerable. Motor manufacturers were undertaking the mass production of new designs. Factories which had been producing mechanism for artillery were now making machine-tools for paper-works, mines, etc.; one had started crucibles for special steels and had built an open hearth furnace. Some works

were utilizing cutting out and stamping presses, which had been set going during the war, to make what had formerly been German products—small ironmongery, sewing-machines, lamp-burners, household implements, and bazaar goods, etc. A manufactory of large shells, employing 2,700 hands, was making locomotives and plant for sugar-factories; others were making motors for the liberated regions. Lastly, small works that had associated for the manufacture of war material got rid of their special plant, broke up their associations, and resumed their former lines of business: boilers, ironworks, repairs of cycles and motors, rings, buckles, bolts, umbrellas, and domestic utensils. New means of production were also brought into play, the construction of which had as a rule been undertaken for the purposes of the war and was nearly completed at the time of the Armistice—in particular heavy metallurgical appliances which became superfluous on the restoration of Lorraine to France. Electrification of works was resorted to, and many electrical motors were installed.

Ironworks resumed the manufacture on a large scale of iron pipes and the mass production of railway material, and were working normally by the beginning of 1919. In spite of the shortage of labor, molders were, in general, busy; and it was the same with the manufacture of aluminium. Makers of alloy steels had less occupation, now that war orders had ceased, but the production of calcium carbide was proceeding very actively.

Toward the end of 1919, in spite of all efforts, the personnel employed in the metallurgical industries showed a decline in numbers, and the revival had not everywhere been as vigorous as had been hoped. In the liberated regions the machinery recovered from the Germans required lengthy and extensive repairs. Out of 90 blast-furnaces existing on the 1st August 1914, only 15 had been relit in July 1919. Resumption of work was much hindered by the pillage and systematic destruction that had taken place.

Nevertheless work continued actively during 1919 in various districts. Certain works had resumed their former line of production, retained their additional labor, taken advantage of their war equipment, and increased their output, which took the form of railway rolling-stock, shipping material, agricultural machinery, wire-drawing machines, turbines, rotary printing machines, sewing-ma-

chines, tanning and tawing machinery, weaving-loom, mechanical equipment, etc. There was satisfactory development in the Toulouse area.

Foundries were flourishing and had abundant orders, but losses of personnel and scarcity of coke or metal caused a few stoppages. Work was plentiful for foundries casting pieces of machinery, for wiredrawers, for factories cutting out, cupping, and stamping sheet metal, and also for heavy boiler works; but there was acute depression during 1919 in the electro-metallurgical industry: in spite of high wages French workmen would not consent to work in lonely and mountainous districts. Moreover foreign competition made itself felt once more, especially that of Germany.

During 1920 metallurgy was chiefly affected by the scarcity of coal. We have given above, page 282, the actual figures of its output, which, in spite of the recovery of the factories of Lorraine, were in 1920 much below those of the pre-war period. The output, moreover, could not be evacuated, for want of transport facilities. There was also a shortage of cast and wrought iron, of copper, steel, girders, ore, iron sheeting, tubing, etc. Skilled labor was difficult to engage. In the liberated regions it was kept away by the housing crisis, and the return of refugees to their localities met with obstacles.

In spite of these difficulties, the energy displayed by the manufacturing industries appears considerable. Factories were started, enlarged, improved, and undertook new lines of production. The construction of important iron- and steel-works was reported, of foundries for the manufacture of heating apparatus, and of copper, bronze, and brass foundries. A former aeroplane factory was making weaving-loom. There is mention fairly generally of the opening of new manufactories of bolts, edge-tools, electric lamps, agricultural machinery, pumps, and apparatus of all kinds.

Manufacturing processes for the cutting out, cupping, and stamping of metal were being applied with increasing efficiency to the production of small articles; efforts were made to meet foreign competition in respect of thimbles, drawing-pins, smokers' requisites, etc. A firm was making these, by mass production, in series of 200,000. Electro-metallurgical works, which were still short of staff, were employing only one-third of their available water-power. To

attract labor, employers were improving social conditions, building workmen's houses, and starting co-operative societies; but building operations proceeded very slowly.

We shall supplement this general survey of the metallurgical industries by a brief description of certain branches that chiefly concerned the civilian public.

The manufacture of *steel pens*, which normally occupied 1,700 hands (the majority of them women and children) in three factories at Boulogne, ceased in August 1914. One of the three factories resumed, with 500 out of 700 hands and with short hours, at the end of 1914; a second resumed with 400 hands out of 700. The third remained closed, for lack of skilled operatives. At the end of 1915 the two factories were carrying on their work with 1,100 employees, but in the face of countless obstacles, their task becoming increasingly difficult as mobilization made gaps in the ranks of specially qualified workmen and foremen. The third factory, which used to employ 300 hands, remained closed for the same reason.

In 1916 metal pen factories attempted the manufacture of cupped articles, needle-cases, pencil-cases, pen-cases, etc., formerly German products, with which the market used to be glutted before the war. Good results were obtained even as regards the export of these, but the industry could not be developed for want of qualified hands and of raw material—steel, brass, and so forth. At the end of the year, the staff was working only in rotation.

Constructional engineering and dockyards. We shall not refer in this section to engineering work in general. Works engaged in the manufacture of machinery and metal-working factories as a whole, except such as were solely or mainly engaged on setting up machinery, worked for munitions under the conditions that we have been summarily describing. Although many constructional engineering and marine engineering works, and particularly the latter, did munition work, we shall briefly indicate the features of their own special trades.

Constructional engineers were very little occupied from the time of the mobilization. This industry, being concerned with the building trade, was brought to a standstill or worked only with a reduced

staff. A few engineering works, however, undertook army contracts during 1915 and became very busy in consequence.

Iron ship-builders similarly had no new ships in course of construction during 1915; they did repairs, especially in the Marseilles area; and were short of raw material and labor. The stagnation continued during 1916 in the various branches of constructional engineering.

In 1917 this industry was reported to be moderately active on orders from civilian customers, and to be having difficulties in connection with transport and supplies, even when engaged on contracts for munitions. Many works were employing only part of their plant and a personnel far smaller than in peace-time. A ship-building firm had seen the number of its hands drop from 2,200 before the war to 700 in July 1917. Other yards however are mentioned which had plenty of raw material and were building ships, mountings for heavy guns, tugs, and 600-ton lighters. The difficulties of railway transport led to a more extensive use of the water-ways, for the submarine campaign had brought about increased activity in the construction both of small anti-submarine vessels and of merchant ships.

Works were very busy in 1918 on the production either of war material or of plant for new factories; they could not cope with their orders, being short of special hands, of steel sheets, angle-irons, and steel bars. Building and repairing yards were reported to be busy and employing much labor, on lighters, tugs, and cargo-boats for the coastwise trade.

After the war, works and factories received numerous orders for mine and factory equipment, etc., but they were frequently short of labor. Engineering had, immediately after the Armistice, resumed its normal course, but had difficulty in obtaining iron and steel sections, bolts, and rivets. There was pronounced recovery in the Paris area, in spite of the lack of wheelwrights, farriers, and blacksmiths. As regards new construction, though yards had experienced a good revival at the end of 1918, they were now short of wood, of drawn sheets, and of skilled labor. Work slackened occasionally in consequence, but, in spite of this, trade remained good, especially in the Provençal area.

Shipyards had no difficulty in obtaining their raw materials at

the end of 1919, but were short of labor. While some yards were busy, others were not producing up to their full capacity, owing to out-of-date machinery and old-fashioned organization.

The yards were equally busy in 1920, and some were also building railway wagons. A firm that was employing 300 workmen in July 1919 had 450 in January 1920, but complained of their lack of skill and of a shortage of certain supplies (sheet-iron, rivets, and coal).

Although we do not propose to deal with the shipping industry in this volume, the following summary of the ship-building trade before, during, and after the war, may be of interest.

*Number of vessels of 100 tons (gross tonnage) and over,
sailing and steam, launched in France.*

<i>Year</i>	<i>Number</i>	<i>Tonnage</i>
1913	89	176,095
1914	33	114,052
1915	6	25,402
1916	9	42,752
1917	6	18,828
1918	3	13,715
1919	34	32,663
1920	50	93,449
1921	65	210,663

Motor cars, cycles, tubing, etc. We shall show in the chapter on 'Transport' the prodigious development of motor transport during the war, and especially for military purposes (see below, p. 357). It is easy to understand therefore that motor factories making large and small lorries for the transport of materials, goods, supplies, and munitions, or carriages for generals, staff, and other officers, were almost monopolized by the requirements of the war. The more important factories also built tanks and other motor-driven military engines; and part of their machinery was employed to produce shells, gâînes,¹ etc. They were essentially war factories, and operated as war factories. The luxury car for private customers became during the war a quite subsidiary production; even lorries and their spare parts were only obtainable by manufacturers and traders with difficulty if they were not army contractors. The situation, as is

¹ *Gâînes*. See note on p. 290.

well known, completely changed after the Armistice: many motor factories that had been started during the war hoped to maintain their production by sales to private customers, and even some factories that had not made motor cars during the war set about the manufacture of these after the Armistice, occasionally with much success.

The production of luxury cars was abruptly stopped by the mobilization, which canceled old orders and brought no new ones. But makers of heavy lorries went on working with a staff reduced to three-quarters or two-thirds of the former numbers. As regards bicycles for private customers, a good recovery was reported at the end of 1915, although labor was restricted and there was a shortage of tubes and various parts. Certain makers of chains and accessories received orders for military supply; one of these was now employing only 100 men and women against 450 in normal times; he could have doubled his staff but for the lack of raw material. In 1918 it was the shortage both of labor and of material that prevented small bicycle factories working for private customers from executing orders.

After the war a promising activity was reported in the manufacture of weldless tubes, which the Germans used largely to supply, but orders were restricted by the high prices. Similarly the position of motor car works was good, and occasionally excellent, during 1919; many were employing more hands than before the war, and a large firm was said to have orders enough for three years. There was a shortage however of specially skilled mechanics, and the output in consequence was in some instances only up to two-thirds of the capacity. In the Paris area the motor exhibition was expected to lead to very active trade.

In 1920 the manufacture of motor cars was proceeding as vigorously as ever, and there was even more work on repairs. Factories were being enlarged. Firms were making arrangements for mass production, and for repairs on a large scale of motor lorries and cars sold off from army stocks, etc. Bicycle factories had steady employment.

The manufacture of *agricultural machinery* was completely arrested by the mobilization; in the Paris district a large factory took up munition work. However, during 1915, makers of machinery

were working ten hours a day on plant for wine-cellar and for the manufacture of sparkling wines. There were even orders for the export trade, but labor was short. At the end of 1915 manufacturers were unfavorably situated, owing to the scarcity of skilled hands, but the lesser engineering shops, blacksmiths, and farriers were overwhelmed with work, especially in small localities, where they were called upon to repair agricultural implements. Makers of bread-machines, which were compensating for the shortage of labor in bakeries, had been receiving numerous orders since the outbreak of war.

In 1916, makers of agricultural machinery and apparatus for viticulture had plenty of orders, and so had makers of bread-machines, but could not execute them for want of skilled labor. Many orders also came from abroad (Holland and Italy) for mowing-machines, weighing-machines, etc. Exports might have been considerably developed to Italy, Spain, Sweden, Russia, and other countries but for the scarcity of raw material and frequently of labor.

In 1917 manufacturers and repairers of agricultural machinery and engineering firms working for private customers had abundant orders; they were supplying both the Ministry of Agriculture and the French public, but could not cope with foreign orders, and saw their business restricted by the shortage of skilled artisans and the difficulty of procuring the metal goods they needed. The reports mention that important works were being constructed for the manufacture of agricultural windmills, and that spraying-machine factories had been opened. Certain firms, having been relieved, as a result of an agreement between the Ministries concerned, of the obligation of turning shells, were obtaining the material required for their own line of business, the manufacture of agricultural machinery. In 1918 the same causes of trouble prevailed, aggravated by the congestion of the railway stations. There were no exports.

Agricultural machinery was in great demand immediately the war terminated; factories were enlarged and their staff increased; and there was an active inquiry for turners, fitters, and hands for planing and countersinking. Manufacturers would have employed as many men as before the war had they been able to get materials.

In 1919 the old factories had resumed their normal working, and many took measures with a view to mass production; but the difficulties in respect of labor and materials still prevailed, and the state of the exchange militated against exports. The situation of the small country workshops was critical: as the workmen who had been mobilized for work in factories remained in the towns, wheelwrights, blacksmiths, and edge-tool makers were left entirely without labor. Conditions were unchanged in 1920.

The *metal toy* industry showed an interesting revival as early as the beginning of 1915, in spite of the dull season, owing to orders from England and America; there seemed to be hope of an era of prosperity for this trade, now that it was rid of German competition. But labor was insufficient for the execution of the large foreign orders. Nevertheless the toy trade (both wood and metal) continued to flourish during 1915. Lead soldiers were the principal output. But 1916 saw the end of this activity. A firm that formerly had six months of active trade (at the end of the year) and six dull months was now working with its normal staff six months for the French market and the six months of the dead season for export. A maker of india-rubber toys exported, in 1915, goods to the value of a million and a half francs to the English, Swiss, and American markets, from which the Germans had now withdrawn.

The manufacture of metal capsules for bottles, one of the principal industries of the Gironde, was left without employment after the mobilization, as a consequence of the cessation of business between Germany and the wine dealers of this department. But there was a marked recovery by the first half of 1915.

At the end of 1916 manufacturers of tin bottle-caps were reported to be short of raw material, and their activity was reduced by the same cause in 1917. To remedy the scarcity of labor, which was also felt, it is mentioned in the reports of the second half of 1917 that the old hand machinery was being replaced by a new machine which was operated by two persons and did the work of ten of the old machines, so that altogether two hands could now do what 28 did formerly. At the end of that year labor was easier to procure, capsules for champagne bottles were much in demand, but lead and denatured alcohol for varnishes were scarce. This impedi-

ment together with the lack of coal and the congestion of the railways hampered this industry during the first half of 1918, and there were no exports.

In 1919 the industry was short of labor, for the American Commissariat was engaging workwomen at higher wages. On the other hand, at the end of the year, the supply of materials became easier and female labor was less scarce. The recovery was complete in 1920 and trade very active, in spite of the lack of aniline dyes.

The manufacture of *sheet-metal* and *metal boxes* was severely tried at the time of the mobilization; but by the earlier months of 1915 some of the factories, having undertaken the manufacture of grenades, were busy. The situation of the others was said to be improving in the course of the year, because of the numerous orders for sheet-metal, restricted however by the dearth of labor and material. There was much demand down to 1916, the German supply having ceased.

The trade in preserved food tins was very active, and manufacturers could not cope with orders, owing to the increased consumption of tinned food in the army zone.

At the end of 1916 many factories of sheet-metal and metal boxes were working normally, in spite of the difficulty of procuring the necessary metal. A manufactory of metal boot-scrapers was employing 162 hands in place of 75 before the war, and besides supplying certain articles for national defense purposes was exporting to the Far East. A factory making tin-plate flasks was mentioned as being busy; there is also reference to the starting of a manufactory of articles of rolled sheet-metal.

In 1917 makers of sheet-metal were regularly supplying the Engineer Service, the explosives factories and paper-works. But metal box factories were obliged to suspend work temporarily, for want of tin-plate. One factory had divided its staff into two shifts, which worked on alternate days. The dispatch of consignments was a matter of difficulty.

In 1918 the preserved food trade was in full swing, but makers of containers were short of tin-plate; they sometimes could only obtain delivery of it by motor lorry, so that a factory was paying 200 francs a ton for carriage, which by rail would have cost 18 francs. The dearth of coal was not excessive, and, if skilled work-

men were scarce, there was a sufficiency of female labor. Work continued regularly in sheet-metal factories.

In 1919, after the war, metal box factories were short of tin-plate, which had become unprocureable in France. They were buying it in England, with the result that the container in some instances cost more than its contents. There was also a scarcity of skilled workmen.

The reports of the early months of 1915 state that manufactories of household implements and table-forks and -spoons were unable to start work again for want of supplies of sheet steel. In November 1915 a spoon and fork factory in the Vosges, which had been closed since the mobilization, reopened, but worked with a reduced staff and did no export trade.

Manufactories of *domestic implements*, and especially brass foundries, took up the production of trench ovens or of steel castings for shells, as orders from the public had completely ceased. In 1916, makers of tinware and domestic utensils received many orders; and so did spoon and fork factories in 1917, but could not execute them for want of labor and materials. In 1918 it was principally the lack of tin-plate that restricted the output of tinware for household and garden purposes.

After the war, certain manufacturers of tinware were busily occupied during 1919 in supplying civilian requirements, and found less difficulty in procuring metals. But they were hampered, as were also makers of domestic utensils, by the restrictions on the import of sheet-metal, iron, mild steel, etc. They applied for the withdrawal of these restrictions, as the metals in question were difficult to obtain in France.

At the end of 1919 the manufacture of aluminium household ware, being freed from German competition, greatly developed; but there was a shortage of machinery, of gas, and of skilled hands for welding. Raw material from abroad was still subject to a high import duty and none of the output was exported. Mention is made of the starting of works for the manufacture of galvanized buckets and wash-tubs, and for the production of household utensils by cupping; and a new manufactory of household tinware was already employing 150 hands. Certain small-tool factories were also overloaded with orders, but were short of skilled labor, metal, and coal;

they were being adapted to the use of electrical power. In 1920 manufactories of household utensils were still short of skilled hands, and tin-plate remained unprocureable in France and had to be purchased in England at onerous prices.

As regards *cutlery*, it was reported at Thiers, at the beginning of 1915, that orders for table-knives had ceased, but that the orders for clasp-knives, razors, penknives, and scissors far exceeded output. Shortage of labor and dearth of steel obliged manufacturers to neglect numerous orders from England, Russia, South America, and Egypt. At the end of 1915, however, cutlers were very busy.

In 1916 scarcity of steel and of labor prevented the cutlery industry of Thiers from executing all the orders received from countries that had previously obtained their supplies from Germany. The shortage of wood for handles and of coal for the forges restricted in particular the export of butchers' knives to Buenos Aires, a very active trade in normal times. But makers of safety-razors were working for export. Makers of surgical instruments were short of hands, their workmen having been transferred to munition factories. The position was similar in 1917—plenty of orders, but scarcity of labor and materials.

The cutlery industry of Auvergne was reported in 1917, in spite of the unfavorable conditions, as having maintained its output at 60 or 70 per cent of the normal, especially by means of labor-saving machinery. The drilling and shaping of knife handles, which used to be done by hand by men, was now done by machinery run by women. Blades were being stamped instead of being forged, and disabled men were learning to become hafters. Workshops making surgical apparatus and artificial limbs were also short of labor, but the Health Department secured regular supplies for them of all the materials they needed. The export of surgical instruments had ceased, except to Italy.

Labor was not discharged in the cutlery trade after the war, but work diminished for lack of orders, as purchasers were counting on a fall in prices. At the end of 1919 the Auvergne cutlery industry remained only moderately busy; too many cutlers adhered to out-of-date methods and machinery, employing only members of their family, and there were no large factories. In these conditions, competition came into play, and French manufacturers experi-

enced for the first time Japanese rivalry on the Egyptian market. Other cutlers, however, had plentiful orders, for German competition had not yet, in 1920, made itself felt.

As regards *ironmongery*, it appeared, according to the reports, to be reviving in the second half of 1915. Some manufacturers were engaged on national defense work, others on supplying the public, but shortage of labor obliged some to refuse orders. The manufacture of *files*, which had been stopped since the mobilization, revived, notably in the Nancy area, where two factories started work. Makers of metal rings at Saint-Claude (Jura), who had numerous orders from pipe-makers, were short of materials—nitric acid, benzene, and German silver; so much so that they were threatened with having to close at the end of 1915. At this period manufacturers of ironmongery and of tools, nails, screws, files, and bolts had heavy orders from the army, but could not in all cases execute them, for the usual reasons.

In 1916 ironmongery was stated to have many export orders. Makers of locks, swivels, and chains were dispatching goods to England, Spain, Italy, Greece, and South America. French manufacturers were also supplying dish-warmers and paraffin stoves, formerly made by Germans and Austrians. Trade with civilian customers was likewise increasing in the file industry. Makers of buckles, buttons, and metal articles for dressmakers would have had plenty of work to do but for the deficiencies so often noted. During the same year manufacturers of ironmongery continued to export, but on a smaller scale. They were sending umbrella frames to China; and to Switzerland and England the small tools of which Germany formerly had the monopoly, such as pincers, screw-drivers, and bootmakers' and clockmakers' implements.

We may note that in 1917 a file-factory, which used to employ 55 hands (including 4 women) before the war, was now working for shell-factories with 97 hands, including 14 women, some of whom were running machines. A new file factory was opened at the end of the year, and another was enlarging its works. Boiler-makers had difficulty in recruiting labor and in procuring sheet-iron, copper, tubes, petrol, and calcium carbide. An important factory suffered from the same troubles and was prevented by the lack of transport facilities from dispatching goods to Algeria and Tunisia.

It was reported in 1916 that factories producing shuttles, hooks, and needles for embroidery frames and knitting-needles, articles which were formerly procurable only in Germany, were increasing their output, and were unable to satisfy the demand of the hosiery trade. A factory in course of construction during the earlier part of 1916 expected to multiply the output tenfold. Another factory undertook the manufacture of spring needles. At the end of the year French manufacturers appeared to be in a position to supply the country's hosiery trade, and were even exporting to Spain. Other manufacturers showed steady perseverance in trying similarly to free the home market in respect of self-acting needles, and of needles for embroidery frames.

The reports mention in 1917 that a maker of self-acting needles for hosiery had delivered in December 30,000 of these needles as against 2,000 to 3,000 in the preceding months, but he was short of sufficient Sheffield steel to increase the rate of output.

The production of self-acting needles developed after the war, and was amply sufficient for the home market; in one district a successful attempt was made to utilize for the purpose steels of local manufacture (Dijon). But during 1919 the scarcity of special hands prevented the industry from meeting the very large demand.

The manufacture of *bronze and imitation bronze* work suffered severely at the time of the mobilization, and most of its workshops were closed. As this industry produced chiefly fittings for illumination, it was bound up with the building trade, and, like it, remained stagnant during 1915: there were few orders and no labor; the price of metals had risen and there was nothing to suggest the prospect of a revival. As time passed, conditions did not much improve; there were hardly any orders, for no one wanted imitation bronzes or copper-work for their houses.

As regards *electrical apparatus*, a Paris firm was mentioned during 1916 as having adapted its machinery to produce electric pocket torches, hitherto an exclusively German article; 200 women were doing this work, and 200 others were making dry batteries. In 1918 the personnel engaged in this industry had perceptibly increased, and a manufactory of accumulators was started.

After the war, activity remained about the same. But at the end of 1919 there was a great development in the production of electri-

cal apparatus—motors, electrical machinery, and meters; there was a large output of small motors to drive machine-tools, and certain factories were considerably enlarged.

As for *clock- and watch-making*, the small shops were reported to be intermittently busy during the first half of 1915 on the production of wrist-watches; but the sale of the well-made watches of the Besançon district, and of clocks, had stopped. The workshops of the Haute-Savoie making clock-work parts had many orders, but their output was restricted by shortage of labor.

Toward the end of 1915 manufacturers of clock-work had abundant employment, owing to the popularity of wrist-watches and flat watches of cheap make. Some of them, who were producing fuses and parts of fuses for munitions, were unable to satisfy the demand for clock-work. Makers of springs also had numerous orders; the Swiss, who supply the whole world, had exhausted their stock of watches and were pressing the factories of the Doubs, which have the monopoly of the manufacture of escapements, to supply these parts, which are the indispensable regulators of clock-work. The industry delivered, at the end of 1915, only one-third of the cylinder escapements that the Swiss required. A spring factory was reopened in the Meuse with more than the normal number of hands; and springs were exported to England, Spain, and Italy.

Most of the manufactories of stampings and of articles connected with the clock- and watch-making industry, such as watch-cases, dials, and hands, had large orders, and would have been exceedingly prosperous had they not been threatened with stoppage owing to the dearth of brass. The reports of the same period mention that the opticians of the Morez district (Jura) had been working for the French and British armies, and were endeavoring simultaneously to satisfy their civilian clientele. They executed some few export orders (for England, Italy, and Russia). But they were short of materials—nickel, steel, brass, German silver, and glass, which used to come from Germany.

These difficulties prevented the opticians of the Jura from exporting in 1916; a few makers of binoculars, besides supplying French customers, met in some slight degree the numerous orders from England and North America. The clock-work industry continued to receive orders from Spain, Holland, Italy, and especially

England; and makers of clock-work parts in the Cluses district, who worked exclusively for Switzerland, were busier than ever. Certain special parts manufactured by them replaced the German article on the French and foreign markets. At the end of 1916 the clock and optical trades were extremely active, were producing new designs, and were advertising with a view to extending their exports of clock-work parts to Switzerland, and of watches to the United States and Russia. Unfortunately the difficulty of procuring raw material, particularly steel and brass, was constantly increasing; and the scarcity of skilled labor further restricted output. Several works were prevented in 1917 by these causes from carrying out extensions; and the manufacture of watch-cases, which might have been very active, was checked by the lack of the petrol and hydrochloric acid required for the scouring and cleaning of the parts.

In 1918 the clock-work industry of the Haute-Savoie, which, besides numerous workshops, had many workmen employed on out-work on the production of detached parts, received a great quantity of orders from Switzerland, for pinions, clock-work parts, etc.; but it could not complete them, because it had devoted itself since the outbreak of war to the manufacture of parts of fuses. The hope, however, that the free zone¹ would be abolished by the anticipated commercial treaties had stimulated manufacturers to improve their machinery, so as to increase output and undertake new lines of production, such as small pieces of mechanism. The national horological school at Cluses had been training disabled men with excellent results.

In 1919 clock-work factories endeavored to utilize the numerous lathes acquired during the war for the production of measuring and registering mechanism of all kinds. One factory, profiting by the experience obtained in the manufacture of altimeters, undertook that of aneroid barometers, formerly made in Germany; another took up the commercial development of a patent automatic gas-lighter; and a third produced cash registers. Demand, however, was not very great, and orders from Switzerland were increasingly re-

¹ Portions of the department of the Ain and of Savoy have for different periods, but principally since the Treaty of Vienna, enjoyed important customs franchises, and benefited moreover by the neutrality of Switzerland. [Translator's note.]

stricted. The activity of clock-work factories continued on a reduced scale until the end of 1919, because manufacturers situated in the free zone who desired to specialize in mass production (particularly of alarm-clocks) were hampered by the prevailing customs régime, which impeded the sale of their output in France. Owing to the lack of skilled hands, makers of clock-work instruments of precision (meters, workshop telltales, gas-lighters) were slow in their delivery of goods to England, where the market was, however, favorable. The export of clocks, which had flourished before the war, was hindered by a 33 per cent *ad valorem* import duty. Opticians, who exported to most countries, met with serious competition from North America, England, and Germany. They were taking up the question of remodeling their machinery and adopting new processes.

It was recorded at the end of 1919 that the French clock-work industry, which used to be dependent on Switzerland for spiral springs, hands, jewels, screws, and stampings, had made a vigorous effort toward development. Factories had been started or enlarged, but the output was hardly sufficient to meet home requirements. Springs alone were exported on a large scale. On the English market conditions were favorable for gas-lighters and extinguishers, and for workshop telltales. French alarm-clocks, instruments of precision, meters, and metal barometers were now superseding German articles manufactured before the war by large scale mass production. The labor employed, which was as numerous as in pre-war days, was nevertheless inadequate, and specially skilled men were scarce. The employment of women was increasing; a class for girls had been started in 1917 at the horological school at Besançon, and numerous pupils had been trained there. The question of the free zone was still a source of trouble for the district that supplied Switzerland. Finally, though the supply of brass and jewels was fairly satisfactory, that of steel was deficient; the manufacture of steel watch-cases was accordingly giving place to that of cases made of gold, silver, or bronze.

CHAPTER XVI

PRECIOUS METALS AND PRECIOUS STONES

BEFORE considering the changes that the war brought about in the precious metal and precious stone industries, we shall give a brief sketch of their position in 1913. The raw materials involved are platinum, gold and silver, precious stones, and alloys. As regards platinum, France produces none, and the chief source of supply, in 1913, was Russia: the Urals yielded about 17,160 lbs. out of a total world production of 18,480 lbs. During the war, as Russian supplies soon ceased, it became necessary to study the means of replacing platinum by substitutes in the various processes to which it is applied; for this metal is employed not only in jewelry, but in laboratories for the construction of apparatus; in the chemical industry as a catalytic; and for hypodermic syringes, etc.

As to gold, the chief producing countries were the Transvaal (40.3 per cent of the world output); the United States (19.9 per cent); Australasia (11.6 per cent); and Russia. France produced only 0.4 per cent of the total output: 4,717 lbs. in 1913.

The principal producers of silver were the United States and Mexico. The world production in 1913 amounted to 6,964 tons, of which the French share was 68,790 lbs.

Appendix XXXVI gives the foreign trade of France (transit excluded) in gold, silver, and platinum, in 1913 and during the period of the war. It will be seen that, very naturally, her imports of these raw materials considerably exceeded her exports.

As regards precious stones, diamonds, pearls, rubies, emeralds, and sapphires occupy a separate category. The market in rough diamonds was centralized in London; jewelers bought their stones there, and had them cut in Antwerp, Amsterdam, Paris, Saint-Claude (in the Jura), and in a few German towns. Paris had likewise become a notable center of the trade in pearls and colored gems. Semi-precious stones were an important article of commerce, but subject to changes of fashion; imitation stones gave rise to a considerable industry. The French imports of precious and semi-precious stones as raw materials of her jewelry industry were in 1913 much larger than her exports.

The precious stone and precious metal industry comprised all the products of the jewelers' and goldsmiths' trades. These might only be sold in France if of a determinate standard of purity: 950 thousandths for platinum, 750 for gold, 800 for silver. As the standard had to be officially verified, it is possible to ascertain the French consumption of these metals and the shares in which home and foreign output contributed thereto. The figures for 1912 are given in Table 71.

TABLE 71

	<i>Kilos</i>	<i>Kilos</i>	<i>Kilos</i>
Articles assayed for the interior	522.6	13,512.0	122,639.9
Exports of articles assayed for export	59.0	1,445.9	19,524.0
Exports of articles on reimbursement of duty paid	5.7	457.8	3,052.3
Articles imported on payment of guarantee duty	40.5	3,683.6	19,173.3
Exports of jewelry of various standards not assayed	..	564.0	1,634.3
	627.8	19,663.3	166,023.8

French manufacture was concentrated in Paris, where 83 per cent of the goldsmiths' work, 96 per cent of the jewelry, and 75 per cent of the gold and silver ornaments were produced. A study of Appendix XXXVI will show that the position of France was favorable as regards goldsmiths' work and silver ornaments, and only moderate as regards ornaments in gold; gold, silver, and electro-plate; and real and imitation jewelry. But the figures do not take into account concealed exports (direct purchases by foreign tourists in France).

The two tables below (Nos. 72 and 73) show, for the precious metal industry and precious stone industry respectively, the index-numbers of establishments at work and of personnel employed, at the dates of the several returns.

The returns for the 1st January 1920, relating to the entire territory, gave the following index-numbers: for establishments, 95; for personnel, 95.

TABLE 72

PRECIOUS METALS

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	11	11
Oct., 1914	8	9
Jan., 1915	26	24
July, 1915	41	36
Jan., 1916	53	46
July, 1916	66	60
Jan., 1917	80	63
July, 1917	85	68
Jan., 1918	85	68
July, 1918	82	66
Jan., 1919	78	63

TABLE 73

PRECIOUS STONES

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	22	19
Oct., 1914	11	16
Jan., 1915	21	32
July, 1915	39	44
Jan., 1916	46	48
July, 1916	53	50
Jan., 1917	57	51
July, 1917	57	52
Jan., 1918	67	54
July, 1918	82	53
Jan., 1919	81	54

The returns for January 1920 relating to the entire territory gave as index-numbers: for establishments, 85; for personnel, 64.

The precious stones industry, a luxury trade, was that which suffered most severely during the war; next in the degree in which

they were affected came printing and binding, then building, then precious metals.

We shall now briefly review the situation of these industries during the war. After the mobilization there was complete stagnation in the *jewelers'* and *goldsmiths'* trades and in the manufacture of gold and silver ornaments; the occasional customer, wanting as a rule only some small repair done, would find at most the proprietor of the business and one or two workmen available. An important goldsmith's firm in Paris was employing only 40 workmen instead of 450.

During the first months of 1915 the industry remained in a precarious condition. Nevertheless several goldsmiths reopened their works, and some business was done in *imitation jewelry*, but, except for decorations, not in real jewelry. In the middle of the year there was some improvement as regards the manufacture of steel ornaments; a manufactory of fancy Paris jewelry was unable to execute its many export orders, as it had only 60 workmen left out of 200. The reopening of manufacturing jewelers' workshops at Marseilles was also reported. In the Ardèche, out of four factories employing 220 hands, two had reopened, one with 10 workmen out of 23, the other with 40 out of 162 in January 1915, and 70 in July. They were producing small articles in current use, medallions, insignia, and so forth. Two important factories had likewise resumed work in the Limoges area. The production of gold and silver ornaments continued to improve until the end of the year. Certain articles, such as wedding-rings, medallions, and chains, which were formerly made in Germany, were in great demand; the demand in fact exceeded the capacity of output, which had been reduced by the scarcity of skilled hands and of raw material. Manufacturing jewelers in the Paris and Marseilles areas had, generally speaking, abundant orders from abroad. Goldsmiths were doing ecclesiastical work for Italy and South America; imitation jewelry makers were working for America and England. But the difficulty of dispatching consignments, added to those above-mentioned, made it impossible to execute all the orders. A manufactory of silver and plated clasps, which had started again after being idle for eleven months, was employing, at the end of 1915, twice as many workmen as formerly.

The jewelry trade, on the other hand, was almost entirely idle, owing to lack of orders.

In 1916 goldsmiths properly so called experienced no revival; but jewelry and imitation jewelry were more favored owing to the influx of orders from France and abroad, where they were supplanting German goods. Mention is made of the visits of buyers from Spain and Italy who formerly had no relations with French firms. Unfortunately, shortage of labor made it impossible to execute many of the orders. A manufactory of plated goods had only 152 workmen out of its normal 250, and could not even cope with the orders of its French customers. Though manufacturing jewelers in the Paris area were employing two-thirds of their normal staff, a firm is mentioned in the Limoges area with only two hands making stampings out of 35 and working only two days a week; another was merely vegetating, with one-fifth of its personnel. Much ecclesiastical gold and silver work likewise was being done, both for France and for foreign countries; manufacturers were supplanting their German rivals in South America, but were faced by the same obstacles in respect of labor and raw material, and were also finding difficulty in the dispatch of bronze and zinc articles to Italy, America, and Spain.

There was continuous improvement, at the end of 1916 and early in 1917, in the jewelry and goldsmiths' trades: exports to America, Spain, and Egypt increased, and so did the number of hands employed, but specialist workmen were still scarce. The business done in religious badges, chains, and chaplets, for which there were both home and foreign orders, did not exceed 1,500,000 francs as against 2,300,000 francs before the war. Metals were being requisitioned on all hands for war purposes and had become scarce; it was difficult to procure supplies of acids and fuel; and transport difficulties hindered consignments.

During 1917, conditions in the precious metal and stone industry remained stationary, and were inevitably less favorable than in peace-time; many establishments were reported as still being closed. A large factory was employing only 140 hands instead of 210 before the war, as its specially skilled workmen had been called to the colors; and this was the usual proportion. Orders were, however, plentiful—for chains, purses, silver chaplets, etc. Customers would

consent, without hesitation, to pay very high prices. But apart from difficulties connected with materials and transport, it was principally the want of labor, and particularly of skilled labor, that checked development of output. Several firms were employing women, some exclusively, as for instance two makers of silver mesh purses. An important firm had taught women to work in gold, but in spite of their remarkable aptitude, this example was not followed. Men disabled in the lower limbs were also being recruited. A firm of goldsmiths was able, with the assistance of commission agents, to oust its German rivals in America, the West Indies, and Spain; it had lowered its cost of production by remodeling its machinery and reducing hand labor. But much remained to be done, in the struggle with German competition, as regards the organization of advertisements, publicity, and the distribution of catalogues.

At the end of 1917 conditions in the jewelry trade were unchanged; the index-number of personnel employed was the same as in the preceding periods. Customers, however, were undeterred by the high prices, and, but for the difficulties above mentioned, manufacturers would have been able to dispose of large quantities of chains, purses, clasps, cigarette-cases, chaplets, pencil-cases, and so on. There was less demand for religious medals. But the restrictions imposed by the allies on the import of luxuries were limiting the amount of French exports, and, as a result, there was a diminution of work in certain factories making belcher chains and plated goods.

In 1918 the trade was prevented from executing more than a part of the large orders that were coming in, by want of precious metals, of fuel, of machinists, and of means of transport; the production of chains and chaplets was reduced in consequence. Output in certain areas was estimated at 40 per cent of the pre-war figure. Two firms, in order to employ their staff and machinery, had undertaken to produce stampings of detached parts required by the army. Trade was active in the Pyrenees and in the Ardèche, where three factories were producing chains, medallions, and silver purses previously supplied by Germany. The great Paris firms had large orders; they had, during the bombardments, replaced the more valuable articles in their shop-windows by others of a less costly character, dispatched some of their goods to the provinces, and

done all they could to keep the aspect of the city unchanged by maintaining their displays.

After the war, the jewelry trade worked uninterruptedly in spite of the lack of precious metals and the scarcity of skilled workmen; orders were, in general, plentiful. A firm is mentioned, which had reopened a year before, was now employing at the beginning of 1919 as many hands (100) as before the war, and was proposing to extend its premises. Three factories had just been started near the frontier by Swiss manufacturers, to make bracelets and watch-stands. *Visible* exports, however, increased but little and work had diminished in certain areas since the Armistice, perhaps as a consequence of the closing of the great munition factories, where many women had been employed at high wages. Goldsmiths' and silversmiths' work, after a shortage of silver metal in the second half of 1918, had perceptibly revived. Clock-case makers would have been able to increase their exports largely if they had been in a position, as is done in Switzerland, to lower the standard of purity of their metals to 500 or 600 thousandths.

It should also be mentioned that many disabled men, after a special training, were working at the jewelry trade; a factory that had reopened after the Armistice with 30 workmen was employing 200 hands in the middle of 1919, including many disabled men.

At the end of 1919, prices, however high, offered no check to demand, and activity in the precious metal trade was limited only by the dearth of skilled labor and material. In certain areas the scarcity of the former was made good by the introduction of machinery, but manufacturing jewelers could not execute all their orders. Some who used to export to Spain found all their output absorbed by the home market. Manufactories of chains, purses, silver bracelets, religious badges, and chains with soldered links, were extremely busy. Makers of silver plate, though fully occupied, were not yet employing their full pre-war staff.

During 1915 gold and silver braid, thread, and wire manufacturers had numerous orders, and those of the Lyons area were beginning to supplant the Germans on foreign markets, especially in the Indies as regards braid. The trade was busy until the end of 1915.

As regards *gold-leaf* manufacture, one factory, after nearly having to close for lack of a foreman, was able to resume work, thanks

to his provisional exemption from service. It at once employed 28 hands and received many orders, particularly from America. Two *gold-beaters* were employing more than half their personnel and had abundant work to do for England and America. Early in 1916 gold-beaters were refusing orders for lack of labor, having only half their pre-war staff. This industry, which before the war was suffering so severely from German competition as to be threatened with extinction, now had Japan as its sole rival.

At the end of 1916 the manufacture of gold-leaf, in spite of the assiduity of such staff as the mobilization had spared, was unable to cope with orders from abroad or with the requirements of makers of 'double.'

In 1917 a new factory was treating auriferous and argentiferous ores by the cyanide process, to extract the precious metals. It was equipped to deal with 100 tons of ore a day, yielding only 2 to 3 kilos of gold and 20 to 30 kilos of silver.

The French output of gold, as has been seen, was small, and in 1918 the scarcity of the metal was such as to reduce the production of gold-leaf; the gold-leaf factory in the Bordeaux area was now employing only 20 hands as against 50; and the gold and silver wire trade had little to do. The scarcity of gold and silver at the end of 1918 was such that manufacturers were hoping that, if it became more acute, the Bank of France would consent to place at their disposal the quantities of precious metals that they needed. It was calculated that the production at this time represented as a whole in quantity (not in value) a third to a half of the pre-war production. At the end of 1919, however, gold-beaters are mentioned as substantially increasing their output. The manufacture of gold and silver wire and thread was also very busy, especially for the purposes of braid making. Its activity was restricted solely by the scarcity of metals and skilled labour.

The *cutting and manufacture of precious stones* were as completely arrested on the outbreak of the war as the precious metal industry. A report mentions however that an imitation diamond factory resumed work in January 1915. In May a few lapidaries' workshops were reopened, but with scarcely 30 per cent of their normal staff. During the latter months of the year the trade remained dull, owing to the scarcity of male labor and of orders.

The diamond cutters' co-operative society in the Jura had been able to dispose of most of its products in England; but was complaining of the impossibility of procuring the bort diamonds required for the process of cutting the diamonds of commerce, for England had prohibited their export.

Conditions in this industry remained the same, in the Paris area, in the early part of 1916; but in the provinces a few diamond cutters had resumed work. The cutting of imitation stones and of colored gems showed perceptible recovery; French jewelers were making active inquiry for these in England and America, as the supply from Bohemia was no longer forthcoming. A manufacturer in the Jura was making remarkable experiments in the production of paste diamonds, imitation stones formerly made at Gablonz in Austria, and of the stones called 'moules' which used to be supplied by Bohemian firms.

During 1916 the diamond cutting and lapidaries' trade improved remarkably at the expense of the German industry, which had reached a high degree of development. The revival was particularly marked in the cutting of Australian sapphires of which the price had increased from 0 fr. 40 to 0 fr. 90 the carat gross. The Australian mines, having lost their labor owing to mobilization, had sent all their available stocks, 160,000 carats, to French workshops. There followed, as a consequence, a recovery in the trade in precious stones. A manufactory of rubies, however, had closed owing to losses of personnel, but had kept a stone cutting shop at work on stones manufactured in Switzerland. Imitation stones, for which the demand was great, were being made by disabled men. The improvement continued at the end of 1916, but was restricted by the shortage of labor; a manufactory of scientific stones had had to shut down, as the supply of the uncut stones from Switzerland had ceased.

In 1917 the precious stone cutting industry was less busy than in the previous year and far less so than before the war. An improvement would have been possible if labor had been available. A few diamond cutters and borers of draw-plates had plenty of work, and if the cutting of diamonds had slackened for lack of uncut stones, the manufacture of imitation stones had maintained its activity.

In 1918, at the request of the syndical Chamber of Jewelers, and

in order to supplant Austro-Hungarian goods abroad, the lapidaries of Saint-Claude set about remodeling their machinery, thereby increasing their output of imitation stones by 50 per cent. All diamond cutters were working for the English, and a little for the Swiss market. The boring of draw-plates with diamond powder was active, and the output was absorbed for munition purposes. But after the Armistice all this industry found itself temporarily threatened by the competition of the Dutch diamond dealers, who during the war had profited by the exchange and the low cost of Belgian refugee labor to build up stocks on advantageous terms. Moreover, there was less work in the diamond draw-plate industry, and there was no recovery here before the end of 1919.

In the middle of 1919 all diamond cutters were busy in spite of the general increase of prices, and employers who had been demobilized were reopening their workshops; the number of establishments at work on the cutting of precious stones increased appreciably between 1918 and 1919. But the scarcity of labor hindered this development, in spite of the assistance afforded by disabled men trained for the work.

There was no longer any dullness, at the end of 1919, in the diamond-cutting trade, and business was particularly good as regards small articles. There was much demand for synthetic rubies for watch-making.

The reports state that the powerful English, Belgian, and Dutch firms were buying up the finest diamonds. Foreign competition was becoming a serious danger: England had established diamond cutting works for her disabled men, and already possessed, in South Africa, the market in uncut stones. The only chance of maintaining French superiority lay in the quality of the finished product, that is to say, in the skill of the French workman; masters and workmen were of opinion that a thorough reform of the system of apprenticeship must be taken in hand if the reputation of the French diamond industry was to be sustained.

CHAPTER XVII

BUILDING AND KINDRED TRADES

A BRIEF survey of the pre-war position of the building trade and of public works brings to light the following facts: as regards the former, the annual output, that is to say the private buildings erected each year, represented a value of two milliards of francs. On the occasion of the last decennial inquiry into building property (1905-1910), the value of private buildings had been estimated at 65 milliards of francs. As regards public works, the average of the credits voted annually for these, during several years preceding the war, had exceeded 400 millions, of which 240 millions was assigned to roads, 120 millions to railways, 24 millions to water-ways, and 24 millions to bridges.

The situation in respect of (1) raw materials, and (2) labour, was as follows:

(1) *Raw materials.* France was amply supplied with raw materials from her own resources. Two thousand nine hundred and sixteen undertakings, the majority of them of small or moderate importance, produced, in 1913, 11,542,868 tons of building stone (freestone hard and soft, millstone, and rubble). Imports in that year amounted to 89,836 tons and exports to 165,901 tons, so that home requirements were largely met.

Brick and tile-works were distributed in large numbers over the whole country, clay being extracted in all the departments, to the extent of 6,149,899 tons in 1913. The figures of imports and exports (see Appendix XXXVII) show that the country's needs in the matter of bricks and tiles were fully satisfied from its own supplies. The output of *slates* in 1913 was 316,953 tons, and of schist for roofing, 4,369 tons. While imports were only 2,705 tons, exports amounted to 38,061 tons.

As for *pottery products*, France was in the main an exporting country; she shared with Belgium the lead among European countries in the supply of *window-glass*; and her resources in *sand* and *gravel* for mortar were unlimited. The output of these reached, in 1913, 6,563,907 tons.

Her production of pure ('fat') *lime* was below her requirements,

but the use of this tends to diminish. *Cement* was manufactured in 32 departments, where 99 works employed 6,075 hands and produced 1,930,066 tons; and the output of *plaster* was, in 1913, 1,751,929 tons, or far more than the country needed. *Ballast* and *road-metal* showed a deficit in the same year: output reached 16,095,774 tons, and exports, 44,095 tons; but imports amounted to 808,881 tons. And yet there is no scarcity of stone for stone-breaking in the country; but the quarries in many instances are not equipped on modern and industrial lines.

Similarly, the French production of *paving-stones* was not equal to the consumption: in 1913 it amounted to 531,094 tons, exports to 651 tons, and imports, to 172,671 tons. As for *asphalt*, four deposits of this were being worked in France, yielding 207,904 tons, but all *bitumen* was imported. The Customs returns, which do not distinguish between asphalt and bitumen, show that in 1913 imports, 58,215 tons, exceeded exports, 20,417 tons.

Lastly, the building and public works industries utilized, besides the above, *metallurgical substances*, cast and wrought iron and steel, of which the supply was adequate; a large quantity of *wood*, of which, as we have seen, the supply was deficient; and *marble*. The number of workmen engaged in the marble industry has been estimated at 15,000, and the greater part of the material (55 per cent) is extracted in the Pyrenees. The output in 1913 was 172,490 tons, and Appendix XXXVII shows a debtor balance on the foreign trade in marble and alabaster: exports, 11,075 tons against imports, 59,630 tons.

(2) *Labor*. The prosperity of the building and public works industry in France, however, is far more dependent on the available supply of labor than on the resources in materials. Before the war the number of workers employed in the industry was 662,736, a figure which may be increased to 800,000 if we include in it the masters, and the small artisans classed as masters. These workers, engaged in heavy labor, were nearly all men, and furnished 360,000 soldiers on mobilization, or more than 40 per cent of their total numbers.

Such were, before the war, the material resources and labor supply of these industries, which were highly prosperous. Table 74 shows that building activity was mainly directed to the construc-

tion of industrial premises; but it also gives the number, rental value, and market value of private houses. It brings to light the development of the building industry between 1900 and 1910, a development which was arrested by the war, and was subsequently resumed only in the devastated regions.

TABLE 74

	1899-1900	1909-1910
Number of properties		
Dwelling-houses	9,173,891	9,475,786
Factories	128,717	137,676
<i>Total</i>	9,302,608	9,613,462
Rental value		
Dwelling-houses	2,917,930,448 fr.	3,329,507,379 fr.
Factories	259,712,315 fr.	342,634,749 fr.
<i>Total</i>	3,177,642,763 fr.	3,672,142,128 fr.
Market value		
Dwelling-houses	53,136,538,000 fr.	59,562,507,000 fr.
Factories	3,981,405,000 fr.	5,236,134,000 fr.
<i>Total</i>	57,117,943,000 fr.	64,798,641,000 fr.
		<i>Proportion to total of properties</i>
	<i>Increase between 1900 and 1910</i>	<i>Percentage of increase</i>
		<i>1900 per cent</i>
		<i>1910 per cent</i>
Number of properties		
Dwelling-houses	301,895	3.29
Factories	8,959	6.96
<i>Total</i>	310,854	3.34
Rental value		
Dwelling-houses	411,576,931 fr.	14.11
Factories	82,922,434 fr.	31.93
<i>Total</i>	494,499,365 fr.	15.56
Market value		
Dwelling-houses	6,425,969,000 fr.	12.09
Factories	1,254,729,000 fr.	31.51
<i>Total</i>	7,680,698,000 fr.	13.45

It may also be of interest to indicate, by a few figures, the importance of the public works industry before the war.

French roads in 1913 had a total length of 694,000 kilometers, of which 38,350 kilometers were national roads, 15,000 kilometers were departmental roads, and 640,523 kilometers were local or parish roads. Construction was mainly directed to the latter and to the main arteries of communication.

Railways on the 31st December 1911 extended to 66,905 kilometers; included in these were 43,096 kilometers of main lines, 11,752 kilometers of branch lines, and 12,056 kilometers of tramways. Of the 54,848 kilometers of main and branch lines, 50,231 kilometers were being worked. New construction was mainly directed to branch lines and tramways.

The position of French water-ways was as shown in Table 75.

TABLE 75

	<i>Rivers, lakes, and ponds</i>	<i>Canals</i>
Extent as registered		
Navigable for rafts—km.	3,052	....
Navigable for boats—km.	8,720	4,966
<i>Total</i> —km.	11,772	4,966
Extent as used		
Navigable for rafts—km.	294	....
Navigable for boats—km.	6,142	4,880
<i>Total</i> —km.	6,436	4,880

France, including Corsica but not Algeria, possessed 177 harbors classed as maritime ports, comprising the five great ports: Dunkirk, Rouen-Le-Havre, Nantes-Saint-Nazaire, Bordeaux, and Marseilles. The principal ports had a length of quays extending to about 63 kilometers; the floating docks in these ports covered a surface of about 900 acres, and stores and sheds 262 acres; but Marseilles was the only great French port that vessels drawing more than 33 feet could enter at any state of the tide: Cherbourg had a depth at low tide of about 40 feet. The total weight of goods loaded

and discharged at the principal French ports in 1913 was 42,296,665 tons, of which 10½ million tons were loaded and the remainder discharged.

The table (Appendix XXXVII) of imports and exports of building and road materials shows a considerable decline from 1915 to 1918 in every item both of exports and imports; it bears witness not only to the dullness that prevailed in building and public works, but also to the difficulty experienced in transporting bulky and heavy materials.

We give below a table (No. 76) showing for the whole of the industry the index-numbers of the establishments at work and of the personnel employed at the dates of the several returns of the Labor Inspectors (territory as reduced by the invasion).

TABLE 76

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	38	20
Oct., 1914	39	25
Jan., 1915	47	26
July, 1915	55	34
Jan., 1916	61	39
July, 1916	62	44
Jan., 1917	59	46
July, 1917	66	51
Jan., 1918	65	52
July, 1918	71	60
Jan., 1919	64	60

The returns for January 1920, which relate to the entire territory, give as to the index-numbers: for establishments, 95; for personnel, 117. There was thus a steady improvement during the war, but the building trade was one of those which suffered most severely on the outbreak of hostilities, and it remained throughout one of the least active of the industries. A distinction must however be made: practically no dwelling-houses were erected during the war, but the building trade found some compensation for this immense loss of work in the construction of industrial and military premises re-

quired for defense purposes, and these in certain areas were extremely numerous.

As regards *repairs*, on the other hand, the position, though not brilliant, was not so bad; new houses were not erected but the old ones were maintained. This class of work may be estimated at one-half the pre-war quantity.

Finally, public works were more active than building proper. But the war affected the former in very different ways according to the category of work involved. Taking the industry as a whole, it brought about a distinct relaxation: outside the military zone, the construction of neither roads, railways, nor canals was now undertaken. But there was great activity in the ports, and a remarkable increase in the construction of hydraulic works, destined to meet the growing demand for electric power and the developing needs of the electro-metallurgical industry. The roads outside the army zone were repaired, while those near the front were remade or improved. As regards the railways, the war brought about great changes in the currents of traffic: some tracks were doubled, connections made, and stations enlarged for the arrival or departure of troops, especially English or American troops. These matters may be studied in the special volume dealing with the railways.

The canals were almost completely neglected, but vigorous efforts were made to improve the ports, which were quite inadequate. By the 1st September 1917, 120 berths had been brought into use and 35 more were in course of construction; 4,000 meters of new quays had been built, the berthing capacity of the French ports had been increased by 25 per cent and their equipment by 50 per cent; new tackles numbered 600.

Building operations that were in progress in August 1914 were all simultaneously abandoned, for want of hands, materials, and money; also as a result of the uncertain outlook of the hour. They were still forsaken at the beginning of 1915, save for maintenance carried out by a reduced staff. However, builders' yards were reopened in various places. The war department had works of some importance carried out at Rouen and Nantes; public works contractors were occupied at Calais and at the port of Rouen, employing prisoners of war, and at Marseilles foreign labor. The house-painters' union too had obtained work on the sanitation of barracks,

schools, and other premises that were being transformed into military hospitals. During 1915 the building industries were completely stagnant. Portland cement was already very scarce, and wood likewise; even if there had been orders, it would have been impossible to execute them for want of labor. Repairs and maintenance alone were being done, and master-painters shrank from undertaking jobs of any size owing to the excessive price of paint. The reports however mention work being done for various reasons: completion of buildings begun before the war which would suffer from bad weather; construction or enlargement of munition factories, and work for the Engineer Service; here and there a few civilian enterprises; and finally, as regards public works in particular: construction of railway lines, of the canal from the Rhône to the sea, and docks and jetties in the harbor of Marseilles. These various undertakings were employing much foreign labor, Swiss, Spanish, and Italian, as well as prisoners of war. Workmen were also busy rebuilding the villages liberated by the first battle of the Marne.

Conditions remained the same in 1916, after the winter season. Certain works for which contracts were made before the war were still in abeyance, because, at the current prices of stone and cement, their execution would entail a loss on the contractor; in some places no lime at all was to be had. Nancy, Lyons, and Marseilles were the only areas where the trade showed some activity on civilian orders, but the buildings involved were inconsiderable. On the other hand, work continued actively on public utility undertakings: barrages for hydro-electric power, breakwaters and moles, docks, railways, tunnels, bridges, canals, etc., in which foreign labor was largely employed; also on the construction and enlargement of war factories—metallurgical works, and spinning and weaving mills working for the army; on the erection of hospitals and working-men's quarters; and finally, on certain works for the army within the zone of military operations. We may also mention the extension, which was destined to develop further in subsequent years, of power-stations supplying current to munition factories. The reports mention that painting contractors were short of labor in 1916, but that materials were more plentiful; linseed-oil however continued scarce and turpentine had risen considerably in price.

The position of the building industry remained indifferent in

1917, though some revival is noticed, slight in the Paris area, appreciable at Lyons. In all the areas, building for private customers was scarce and was confined to indispensable maintenance jobs. There were too many impediments in the way of any development: skilled masons and stone cutters could not be replaced by women and laborers; and materials, wood, lime, cement, and metals, which were placed in the third category in order of priority, were difficult to get transported, dear, and scarce. Building was being done for the army or for factories working for national defense: construction of power-stations, of cloth-mills, wool-spinning mills, and chemical factories; erection and enlargement of munition factories, explosives factories, arsenals, etc., and of building-yards for public works; erection of workmen's dwellings and of military hutments; and finally, on a large scale, utilization of waterfalls, though French labor was wanting. On one of the latter works there were employed, in the middle of 1917, 1,600 workmen, nearly all Spaniards; on another, 600 workmen of whom only 60 were French; on a third, Chinese laborers were engaged on the regulation of a waterfall which was to supply 1,500 h.p. A few special facts are worth mentioning. The municipality of a large town in the south was constructing, out of funds advanced by the State, a hydro-electric factory comprising six groups of turbo-alternators capable of developing 4,000 h.p. This power was to be placed at the disposal, during the war, of munition factories, and subsequently of industry in general. The construction of two moles in the port of Marseilles was pushed on actively and on a vast scale, but there was a shortage of labor for the building of the Rove tunnel on the canal from Marseilles to the Rhône. Committees and associations of contractors were formed in view of the future restoration of the invaded area. A firm was equipping itself for the erection of houses of reinforced concrete, another had established itself on the Marne with a view to building lighters of 800 or 900 tons with the same material, a method of construction pursued with some vigor in the following years. A few workmen were employed on building modern houses in an old quarter of a large city.

A slight apparent revival in the building trade was reported in certain areas at the end of 1917. Buildings begun before the war were being completed. The construction of new factories was being

energetically pushed on. Firms were enlarging their premises for the purpose of working lead, of manufacturing chemical and pharmaceutical products, and of spinning and weaving wool. Important building-yards were being opened for the erection of cantonments for the American army and of workmen's dwellings; and the P.L.M. railway company was setting up new workshops. A considerable number of contractors' yards were being opened for the construction of railway embankments and for the remaking of roads that had been cut up by heavy traffic. Harbor works were proceeding, and important undertakings were in progress or being started for the utilization of water-power. Hydraulic power in one area was to be increased by 40,000 h.p. to a total of 225,000 h.p. A barrage just completed on the Creuse was to yield 1,200 h.p., and another was in course of erection. A company had obtained a concession, extending to 54 parishes in the Nancy area, for the supply of electric power.

During 1918 the number of establishments and workmen employed on embankment work and stone construction increased as compared with the previous year, as a result mainly of important works undertaken in various areas since the beginning of the year: these included the erection of American hospitals, of new railway workshops and larger stations, and of new buildings in munition factories; the transfer of factories from the Paris area to the south and center of France; and the construction of hydro-electrical and electro-chemical works. There was active employment on the regulation of waterfalls and the preparation of aviation grounds. Labor was in great demand and wages had much increased: carpenters were receiving 2 francs to 2 fr. 15 an hour; masons, cement-mixers, and navvies, 16 to 18 francs a day.

Embankment and masonry work in connection with the control of high waterfalls in the Alps, the Pyrenees, and the central plateau had greatly developed, and an inspector gives the following figures (Table 77) of the power available in the Alpine region, which may serve as an illustration.

Projects had been prepared in respect of a number of other falls, and riparian rights acquired, particularly on the Rhône, and also in the Jura, the Dordogne, the Corrèze, etc. Harbor works and the doubling and connection of railway tracks were proceeding actively.

TABLE 77

	<i>Savoie and Haute-Savoie</i> h.p.	<i>Isère</i> h.p.	<i>Total</i> h.p.
Power utilized by factories running before the war	305,000	170,000	475,000
Power installed since the war	49,000	35,000	84,000
Power of factories in course of construction	41,000	20,000	61,000
	<hr/> 395,000	<hr/> 225,000	<hr/> 620,000

Small contractors, on the other hand, were completely idle during 1918; lacking materials and labor, their only work consisted in extremely urgent repairs, such as the making good of damage done by bombardments. The check to the construction of new houses, especially in certain centers where the population had increased fivefold and in the neighborhood of the great munition factories, had brought about a housing crisis in those localities, accompanied by an excessive rise in rents. The various unions of the building trade that were not engaged on war work suffered severely; molders' and sculptors' workshops were closed or idle, and painting contractors were unable to obtain materials. Linseed-oil and turpentine, purchased by the State at 535 francs and 150 to 180 francs respectively, were being sold to painters at 800 francs and 400 francs.

After the Armistice, factories in course of construction were completed, and the builders' yards closed. A slight tendency to recovery was observed as regards the building of private houses; but landowners were waiting, before entering into contracts, till the peace should be signed and the situation clearer; so great, moreover, was the competition for the few residences available that it seemed unnecessary to spend any money on them.

The industries subsidiary to building, joinery, carpentry, plumbing, and glazing, were overwhelmed with orders which they could not execute for lack either of a foreman or of labor, and, in any case, of materials. In the liberated regions, important works were being carried out on account of the various Government services.

Embankment work for the control of waterfalls was continuing. The construction of the moles of the Madrague at Marseilles was nearly completed, having taken nine years. The manufacture of vats in reinforced concrete had been resumed, but made little progress owing to the dearth of iron and cement.

Improvement in these industries proceeded very slowly during 1919. Industrial and commercial premises, banks, cinemas, and workmen's dwellings were being erected. But there was practically no building of private houses, owing to the increase in cost; the cubic meter of masonry worked out at four times the 1914 price. The specification for a house, estimated before the war to cost 900,000 francs, now involved, after reductions, an expenditure of 3 million francs. Landowners refrained from building; the construction of new residential property was not a profitable business because the rent could not be fixed at a figure proportional to cost and to the purchasing power of the franc, owing to the rent restriction regulations on old houses; owners accordingly confined themselves to the strictly indispensable repairs. The housing crisis became in consequence more acute: some factories could not procure labor for want of dwellings; others had workmen's houses specially built for them. There was, however, no unemployment, for there was extreme activity in the liberated areas where reconstruction on a vast scale was in progress: clearing of towns, filling up of trenches, restoration of buildings, factories, railways, roads, and water-ways; repair of high-tension electric wires, etc. Although the number of navvies in those areas was twenty times, and that of carpenters, slaters, glaziers, and masons, five times what it was before the war, there was still a shortage of labor. To make good the lack of skilled hands, training courses were arranged in carpentry, ironwork, plumbing, and so forth. There was difficulty too in getting materials conveyed to the premises under repair, which delayed the work.

In other localities public works were proceeding actively. The construction of the trans-Pyrenean railway was being pressed on; likewise the digging of the canal from the Rhône to the Rhine, the excavation of the Rove tunnel for the canal from Marseilles to the Rhône, and the enlargement of the port of Marseilles. The high cost of such work, however, occasioned some hesitation, so that only 300 workmen were employed at the beginning of 1919 on the im-

provements undertaken to the port of Havre. The work already mentioned in connection with waterfalls continued. A company was adapting a fall of the Durance to yield 40,000 h.p.; similar undertakings were in progress in the Luchon area; and so forth. A large number of lighters were being built in reinforced concrete, and many vats of the same material were being constructed in the vine-growing districts.

Painting contractors found, until the end of 1919, great difficulty in procuring their materials. But they had orders, as also had plasterers, chimney-builders, slaters, and plumbers, because repairs had to be resumed. There was a great increase in the number and importance of firms doing electrical installations, but they were short of materials, especially glass fittings, formerly imported from Germany and Austria, which French factories had not attempted to produce during the war. There was a shortage, also, of plate-glass for shop-windows and commercial premises.

As regards *stone-cutting and molding*, the works in the Sarthe where marble was sawn and polished, which had been completely closed since the 4th August 1914, were reported early in 1915 to be still without labor or orders. A slight revival in stone-cutting did not occur until the second quarter of 1915; there was a similar revival in monumental masonry, which was receiving orders even for export. But apart from this monumental industry, which moreover was far less active than usual, marble and stone cutters had hardly any work. At the end of the year, the quarries and extractive industries of the Nord and the Pas-de-Calais were well occupied, particularly the quarries supplying chalk to steel-works and those supplying ballast and road-metal; for roads were much worn by the motor traffic of the armies. At the end of the year stone-sawing and cutting works were still dull, but in the Nantes area slate-cutting and dressing works were busy on orders for the State and for the departmental services.

The situation was unchanged in 1916. But the stone cutting industry was paralyzed by difficulties of transport; and there was a shortage of such appliances as came from England, helicoidal wire, saw-blades, and diamonds for circular saws. An important marble factory had been adapted to the turning of shells. At the end of the year, except for a few quarries that remained busy supplying mate-

rial for roads and for blast-furnaces, the stone and marble industries were almost completely stagnant.

There was a slight revival of stone-cutting in 1917, but stone-yards, in spite of the small number of their workmen, had no difficulty in dealing with their orders; they were even preparing stone in anticipation of post-war orders. Hardly any stone was being extracted except to meet the requirements of the army front and of the metallurgical industries. The quarrying, cutting, and dressing of slate were depressed, and marble works were employing only a reduced staff.

In 1918 the marble and stone industries, which once more had fairly numerous orders, were hampered by lack of railway-trucks and means of transport, and went through a very critical period; unemployment was pretty general. State works still had only a reduced staff. Conditions did not improve in 1919, either for these or for the quarrying and cutting of stone, because of the depression in the building trade, of the scarcity of labor and materials, and of the lack of transport facilities. Marble works on the other hand received many orders for marble slabs of all sizes for electrical purposes, and especially for war memorials.

CHAPTER XVIII

BRICKS, POTTERY, GLASS

Table 78 shows, for the brick, pottery, and glass industries the index-numbers of establishments at work and of personnel employed, as furnished by the successive reports of the Labor Inspectors.

TABLE 78

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	29	20
Oct., 1914	33	24
Jan., 1915	44	34
July, 1915	54	40
Jan., 1916	59	46
July, 1916	64	48
Jan., 1917	68	53
July, 1917	70	56
Jan., 1918	73	57
July, 1918	71	56
Jan., 1919	62	55

The returns for January 1920, relating to the entire French territory, give as index-numbers: for establishments, 89; for personnel, 65.

The personnel employed, after the first severe blow given by the mobilization, went on steadily increasing, as a result at first of the war manufactures, such as chemical stone-ware and crucibles, and the erection of military buildings and factories; and later, of the revival of peace industries.

Before tracing in detail the vicissitudes through which the several sub-groups of the industry passed between 1914 and 1919, we may give a few general figures to indicate the importance of its output in 1913. Appendix XXXVIII shows the foreign trade (transit excluded) during the years of the war in the principal products of the trade.

Here are a few figures of output in 1913:

Lime and Cement.

	<i>Tons</i>
Fertilizer lime	568,161
Pure ('fat') lime	481,721
Hydraulic lime	2,356,671
Cement	1,930,066

Pottery.

(1) Raw materials:	
Clay for bricks and tiles	6,149,890
China and pottery clay	357,521
Refractory clay	417,617
Marl	1,487,310
Kaolin	62,910
Bauxite	309,294
White clay for special manufactures	448
Dolomite, limestone	1,475,111
(2) Manufactured products:	
Refractory products	350,000
Stone-ware pipes	56,000
Flooring tiles	40,000
Fine earthenware	{ Crockery Faience tiles
Insulators	5,000

Glass.

Plate glass	1,600,000 sq. meters
Window-glass	10 to 11,000,000 sq. meters
Bottles	300 to 320,000,000
Molded ware	1,810 tons (at least)
Chemical and scientific glass	} very small quantities
Optical glass	

There are unfortunately no statistics of output available for the war period, but we give below a few characteristic figures which we have been able to collect, because they serve to illustrate the detailed analysis that follows.

The pottery trade suffered profoundly from the invasion, and its output declined by 25 to 50 per cent according to the nature of the products. The output of fine clay goods on the other hand increased from 350,000 tons in 1913 to 611,935 tons in 1917.

As regards glass, the output had fallen, in 1917, by 80 per cent in respect of mirrors, 40 to 50 per cent in respect of bottles, and by 75 to 80 per cent in respect of window-glass. All the factories in the north and east of France were stopped, and it was only thanks to the construction of new works or the transformation of other factories that the production of mirrors and window-glass reached 2,758,600 sq. meters in 1917, 23 per cent of the output of 1913.

The reader will find the table of imports and exports (Appendix XXXVIII) very instructive in its details, and we will point out a few of its salient features. France was in 1913, on a balance of imports and exports, an importer of ordinary lime and a large exporter of cement; imports of hydraulic lime equaled the exports. Imports of cement were maintained during the war, while exports dropped to one-sixth; exports of hydraulic lime dropped to one-twelfth; and France became in 1917 an importer, on balance, of cement and an exporter of lime. By 1919 she had become an importer of all these materials. It will be seen that she suffered during the war from a dearth of cement.

Imports of graphite for crucibles, and of crucibles, naturally increased. Imports of chemical stone-ware became larger than the exports. France was largely dependent on foreign countries for refractory products, and their supply ceased in a large measure at a time when it was much needed; so that the home manufacture of fire-bricks and other goods had to be developed.

The imports of common glass, window-glass, bottles, and electric bulbs increased and exports diminished; there was even a net balance of imports of common and window-glass, and the dearth of all these products made itself felt. As regards mirrors, earthenware, porcelain, and table glass, the exports of these luxury articles diminished largely; imports diminished likewise, and there remained a net balance of exports; there was also, on balance, an export of optical glass.

Many industries in this group, such as the manufacture of plaster, lime, and cement, and tile, brick, and pottery works, were dependent on the building trade; and these, like the building trade, suffered severely on the outbreak of war and until the middle of 1915. But makers of refractory products engaged all the hands they could find and employed as large a personnel as before the

war, for they received important orders from metallurgical factories working for the State.

At the end of the first half of 1915, stagnation was general in all these industries; some factories that had reopened had been obliged to close again, being unable to procure coal or dispose of their products. Some that had army contracts were reported busy, but this was exceptional. There were large orders, in connection with defense requirements, for refractory goods, for lime and cement for the Engineers, and for containers for the Explosives Service. Lime and cement works suffered in a special degree from the lack of fuel, and many of them, on this account and because of the scarcity of male labor, were unable to work up to their full capacity. We will deal successively with (1) lime-kilns and plaster and cement works, (2) brick and tile works, and (3) fire clay goods, and trace their progress until after the Armistice.

A few *cement* works were able to obtain a normal output from the middle of 1915 onward, because the Engineer Service required cement and not only provided them with the necessary skilled workmen, but also enabled them to procure coal and to obtain facilities of transport. But lime and plaster works had few orders and remained inactive. Lime-kilns had to give up extracting stone, and only dealt on a reduced scale with materials previously extracted. Calcareous deposits, however, of the kinds required for blast-furnaces continued to be worked so far as labor was available.

During 1916 the position of lime, plaster, and cement works remained indifferent; apart from those supplying materials for national defense (and even these worked only intermittently), they were all seriously hampered: by the cessation of building work; by the lack of means of transport, which prevented them both from procuring their fuel and from disposing of their products; by the difficulty of obtaining new parts for their machinery and stone-crushing apparatus; and especially by the shortage of labor. Some were only enabled to carry on thanks to the recruitment, almost exclusively, of Spanish workmen; and the factories that were working with a view to the construction of military buildings employed women.

There was a revival of activity, in 1917, in lime and cement works, because military requirements gave rise to many orders, and

metallurgical factories were being enlarged and new furnaces being built. The extraction of limestone flux was pushed on vigorously. There was some increase in the number employed, but the difficulties in connection with labor, fuel, and transport still persisted, especially where the work was not for the army. Output as a rule reached only 60 per cent of the normal, and, indeed, to bring many of these factories up to date and enable them to hold their own in the economic field would have involved their complete reconstruction. There was but little occupation for plaster works, and at the end of the year they were mostly idle.

In 1918 the constantly recurring difficulties obliged manufacturers to reduce or even suspend their operations, but the obstacles were courageously faced: the scarcity of labor was met by the construction of new kilns, so designed as to enable women and disabled men to be employed; wood was bought and stocked to replace coal; and barges were obtained to bring raw materials and carry away the manufactured products. In spite of this, the improvement noticed in the latter half of 1917 did not continue everywhere in 1918, for some of the industry's troubles became particularly acute in certain areas. A factory that had an output of 30 tons a day could get only 10 tons removed; another that formerly had an output of 75 or 80 was now producing only 20; in the Albi district, the output was only 40 per cent of the pre-war figure. Agriculture, in consequence, was short of lime in certain areas. A manufactory of artificial cement in the Hautes-Pyrénées, recently erected with a view to supplying materials for the construction of hydraulic power stations, was being enlarged.

After the war, manufacturers of plaster, lime, and cement made great efforts to resume or increase their business, but were still encumbered with accumulations of goods, for prices remained very high. There were orders from the liberated regions, and from blast-furnaces (for flux). The return of men from the colors gave scope for some revival in plaster factories; but during 1919, this group of industries was executing only a part of its orders, for supplies of coal were irregular, skilled labor was scarce, and punctual deliveries were impossible. Certain lime-kilns had completely altered their processes; a new factory was being equipped to produce a

conglomerate of soft stone, baked after compression; another to manufacture cement from blast-furnace slag.

Work became plentiful again, early in 1920, in plaster, lime, and cement works; several works, which had been closed since 1914, reopened with a reduced staff, but with improved processes of manufacture. In certain districts in the south, work was proceeding actively for the liberated zone and for Morocco; and yet in another area, output was only one-fourth of what it had been before the war, and fell far short of the demand.

We have seen that down to the end of the first half of 1915, brick and tile works were almost completely idle. Conditions, being dependent on those prevailing in the building trade, remained unfavorable until the end of 1915. The only exceptions mentioned in the reports were the brick works that had orders for materials for building or enlarging munition factories, or orders from the Engineer Service. Output, during the last months of 1915, was scarcely one-fifth to one-third of the normal; exports had much declined since war broke out; moreover, coal was dear, facilities for transport were defective, and labor was disorganized. Work was almost at a standstill in the Toulouse area. There was little change in 1916. However, mention is made of a few consignments of enameled bricks and of decorative designs to Algeria and Brazil; and some brick works, in the second half of the year, relighted their kilns and employed a reduced staff to build up stocks with a view to post-war reconstruction. Many other manufacturers, on the other hand, shrank from the risks involved in this policy.

Manufacturers of machine-made tiles obtained contracts from the military authorities; but not all their kilns were employed, and output remained far below the normal. One firm was recruiting women and Greek workmen; others, who owned several different works, were running these in rotation, to prevent the plant from deteriorating. Numerous orders for tiles and bricks were however coming in, even from South America.

The position of brick and tile works was thoroughly unsatisfactory in 1917; there was an acute shortage of labor and of coal. The only works busy were those employed on account of the French or allied armies, and those preparing for the restoration of the invaded region. At the end of the year, however, a few firms that

had been idle for many months resumed work; one of these had procured enough coal to bake its 1914 output of dried bricks. A brick-field in Normandy started again with Chinese laborers, another with a staff of women. Conditions remained the same in 1918.

In 1919, brick and tile works, still under the influence of the paralysis of the building trade, were short of coal and labor, and were partially idle. In the Paris area the resumption of full working was dependent on the willingness of the Belgian Government to grant exemptions to former Belgian workmen; in the suburbs of Marseilles, firms employing 4,000 hands found their trade restricted by the decree of the 20th January 1920, which prohibited the export of bricks and tiles. Nevertheless a few works were reopened. A brick-field in Normandy had been equipped with a mechanical press, worked by six men, which gave an output of 24,000 bricks in ten hours, as many as eight hand-presses, worked by sixteen men, would have produced.

The position of brick-fields was not satisfactory even in 1920, but it was improving, and firms working for the liberated region were very busy. The shortage of labor was especially felt in the Paris area, where two-thirds of the presses were idle.

Manufacturers of *fire clay goods*, *graphite crucibles*, and *stone-ware* were assuredly among those who showed the greatest energy during the hostilities. From the first, they worked very actively for the army, in spite of an occasional shortage of labor; in the Nancy district, however, business was dull owing to the stoppage of most of the metallurgical factories of the area. Some of the workmen who had been mobilized were restored to their factories early in 1915; and the fire clay industry worked at its maximum capacity, delivering the whole of its output to army contractors. Mobilized workmen were replaced by women and certain works were enlarged.

The reports mention at this period, as an interesting fact, the great development of a factory in the Hérault which, by a new process, was producing fritted dolomite for metallurgical factories, besides lime and certain magnesium products employed as disinfectants at the front. A second similar factory was subsequently started and the personnel employed on this work was increased. Additional labor was likewise taken on in the stone-ware factories

of the Drôme, which supplied goods required by manufacturers of explosives and acids.

In 1916 fire clay works were extremely active; some had been recently started, and the personnel employed in most of them was once more up to normal numbers. The former export trade to America and Italy had been stopped, because the whole output was required for defense purposes. Several articles were now manufactured for which French metallurgy was previously dependent on Germany: substances containing carbon for the fusion of steel, and silica and magnesite bricks.

An Inspector writes: "the manufacturers of fire clay goods have succeeded by their perseverance in considerably increasing their output. All the principal processes which had previously been done by hand, are now carried out by simple and inexpensive machinery. All the fire clay apparatus for the recovery of furnace gases, which was formerly manufactured in Germany, is now produced at home by mechanical presses."

Under the pressure of war needs, substances that were previously neglected were now employed in place of imported materials. The manufacture of silica and magnesite bricks and of certain crucibles for steel-works proved very successful. Experiments were tried in connection with glazed and alumina bricks, but the most remarkable development was in respect of graphite crucibles.

Fire clay works continued equally busy in 1917, and so did factories producing pipes, taps, carboys, and stone-ware recipients for explosives, which used to be imported from Germany; these were giving their maximum output. Some had doubled their staff, and a large number of women were employed. New works were started, and there would have been more of these but for the shortage of skilled hands and of fuel. The production of silica and magnesite bricks was increasing; graphite imported from Madagascar, where large deposits were being worked, was employed for the manufacture of graphite crucibles, which were supplanting those formerly imported from beyond the Rhine. This group of factories remained, for the same reasons, equally busy in 1918, and they were unable to supply their civilian customers.

In 1919, after the Armistice, the manufacture of refractory goods, which had found numerous outlets during the war, should

have been twice what it was before 1914; but most of the works had to limit their production owing to lack of fuel and of railway-trucks. In one manufacturing center the yards and neighborhood of the factories were encumbered with thousands of tons of products. There were numerous orders for graphite crucibles and for crucibles for steel production.

Conditions remained the same in 1920, and output had to be restricted, in spite of the demand, for the same reasons as before. The output of one firm reached only 60 per cent of that of 1913. The manufacture of stone-ware bottles for liqueurs and spirits had revived and half of the products were being exported. But there was an appreciable decline in the output of graphite crucibles; the attention of manufacturers was now chiefly directed to crucibles of large dimensions, such as, before the war, came from abroad, principally from England.

As for ordinary *pottery* (to which we may add, for the present purpose, *cement pipes and slabs*), France was an exporter of these in 1913, and during the war her exports were much in excess of her imports; but both declined considerably. The activity in this group of industries, and principally as regards artistic products—*majolica* and decorative pottery—remained slight during the war. Orders for ordinary pottery remained abundant, but could not be executed for lack of labor.

Potteries and stone-ware factories, however, increased their output in 1916, for the high price of glass gave rise to much demand for their goods, and they were unable to meet it for want of skilled hands. Certain firms had completely ceased to export, the whole of their output of stone-ware, tiles, bricks, and pottery being appropriated to the army.

The position of potteries continued unfavorable in 1917, in spite of the numerous orders; they were difficult to run owing to the scarcity of labor and fuel, and river transport did not adequately compensate for the lack of railway facilities. Some however were busy because they specialized in the production of hospital ware. The situation remained the same in 1918.

The revival occurred in 1919; numerous potteries resumed work to meet the enormous demand of the public, but they were hampered by the dearth of fuel, of skilled labor, and occasionally of

plaster and clay. In 1920 normal conditions were restored in internal trade, but not yet in the export trade, in spite of numerous orders from Switzerland, England, and South America.

The export of *earthenware* fell during the war to one-tenth of the normal, and there was a corresponding decrease in imports; accidentally imports exceeded exports in 1919. In 1915 the position of earthenware makers was uneven: a factory at Calais was employing 50 hands out of 200 in April; a little later mention is made of another in the Paris area with orders for three months ahead, employing 400 hands out of 750, and inconvenienced only by the lack of specially qualified men. In the Nancy area, on the other hand, only two factories were open and these were working at only half their capacity. In the Dijon area, all were closed but one. The same irregularity prevailed during the second half of the year; it was mainly the dearth of skilled male labor that delayed the execution of the many orders in hand. The earthenware works at Bordeaux had great difficulty in obtaining earth and coal, the latter costing 105 francs the ton instead of the pre-war price of 30 francs.

Conditions remained stationary in 1916; one factory was employing one-third of its staff and expected to be obliged to close; another was exporting part of its output to Morocco, Turkey, and Greece; a third was busily employed on orders for the army; but a fourth, which was reduced by the dearth of coal to heating its kilns with wood, had found its business diminished by 75 per cent. At the end of the year certain works were doing well, had orders, and were exporting to England and North Africa; they were employing women on the handling, molding, and turning of the ware, at the same rates of pay as men. But other firms were unable to execute their orders for want of labor suitable for the more arduous work. A manufactory of enamel for pottery made the interesting discovery of the German process for the production of the ware intermediate between earthenware and porcelain.

Many earthenware makers were only working in 1917 with a staff reduced, in some instances, by as much as two-thirds; others were idle half the week to economize coal; disabled men were being trained to do decorative work. Many factories were closed and exports had almost ceased. Conditions became worse in 1918, when work was

being done for the army, but molding and baking for private customers had practically come to an end.

In 1919 this industry, like the other ceramic industries which consume large quantities of coal, was impeded by the irregularity of supplies. One factory, which was employing 400 hands in place of 700 before the war, had only been able to carry on by using wood as fuel, a process too unprofitable to be maintained. The trade, except in a few areas, remained dull, and some of the works had only half their pre-war staff.

Business became very active again in 1920, and earthenware factories, like potteries, met the transport crisis by having their goods removed by motor lorry; export however was difficult to effect, in spite of orders from Switzerland, England, and South America. The ceramic industries found important markets before the war in Canada, the Argentine, Egypt, and the United States; these markets are worth saving, by offering favorable terms to workmen specially qualified to run kilns and muffles, to make saggars, and to enamel.

Imports of *porcelain* were large before the war, and exports even larger, the net balance of exports being 2,300 tons a year. Both exports and imports declined during the war, but the balance was not much affected.

In the Limoges area, 24 out of 28 factories closed in August 1914, and 10 remained closed in 1915; the remainder worked with a reduced staff. The manufacture of dolls' heads, hitherto an exclusively German product, was being taken up. The recovery was slow, as the following figures, taken from the monthly records of the Limoges *octroi*, indicate; they represent the number of kilnfuls fired:

April	1914	226	January	1915	42
May	1914	237	April	1915	60
June	1914	241	May	1915	75
November	1914	56	June	1915	82
December	1914	67	July	1915	91
			August	1915	84
			September	1915	94
			November	1915	102
			December	1915	92

There was indeed a shortage of labor, and workmen were demanding a 10 per cent rise of wages; fuel also was scarce, with the result that the workmen had to remain idle during part of the day. This was the position in the Berry porcelain works; but two small works in the Marne, which specialized in the manufacture of insulators, had reopened and were working for the War Department and the Telegraph Service; this industry was now freed from the competition of the German trade, which formerly enjoyed something approaching a monopoly.

In 1916 the porcelain works of Limoges were at first short of coal, but subsequently received supplies; they produced:

January	1916	70 kilnfuls	May	1916	112 kilnfuls
February	1916	89 kilnfuls	June	1916	106 kilnfuls
March	1916	102 kilnfuls	July	1916	107 kilnfuls
April	1916	99 kilnfuls			

There was thus a perceptible improvement as compared with the first seven months of 1915: 685 kilnfuls against 541; and, January 1916 apart, there was an improvement even over the second half of 1915. Orders were plentiful, but skilled labor scarce. The porcelain works of the Cher, which received their supplies regularly by water, did not suffer from lack of coal, and had more orders than their restricted personnel could cope with. One manufacturer stated that he had exported in the year five times as much porcelain as formerly—to Egypt, Algeria, and Morocco; but this was exceptional.

The situation at the end of 1916 may be summed up as follows: 33 works, which used to employ 7,606 hands before the war, including 2,540 women, were now employing only 4,641 hands, including 2,077 women. This reduced staff could not do more, generally speaking, than deal with the orders of the French market, and even with these only in part. At Limoges, whereas the period 1st December 1914 to 30th November 1915 had yielded 918 kilnfuls, the succeeding period yielded 1,242.

Special attention should be drawn to the efforts made to escape from German domination in certain lines of manufacture that had previously been entirely neglected. As regards *chemical porcelain*, all of which before the war came from Berlin and Saxony, France

was now manufacturing worms for retorts, capsules from 4 to 45 centimeters in diameter, crucibles, containers for acids, and porcelain taps. It had been impossible, before the war, to maintain the struggle against 26 German factories employing 7,000 workmen on the production of *electrical porcelain*. Now four factories were engaged on this manufacture. Two of them, employing 330 hands, including 190 women, were supplying the Posts and Telegraphs, the Air Service, and the Military Telegraphs. Another factory was making small electrical fittings and four million insulators a year of three designs. Another was producing 60,000 sparking plugs for aviation purposes. As regards *porcelain for spinning mills*, three factories were supplying Italy and England, where it was formerly imported from Düsseldorf. As regards *fancy porcelain*, Germany had, before the war, 31 factories with 4,300 hands, making dolls' heads. At the end of 1916 a French factory was making 12,000 heads a day, uncolored, in five sizes; another in the course of 1916 made 240,000 heads, complete, with eyes fixed or closing; a third was making heads and limbs, and fitting the eyes; it delivered nearly 300,000 a year, in 13 different sizes. Experiments are reported in various districts in the manufacture of dolls' heads and of miniature dolls. Five firms were also making perfumery boxes and delivering more than 800,000 of different designs. Porcelain stoppers for beer and lemonade bottles were being made at the rate of 1,200,000 a year. Of funeral emblems (interlaced hands, doves, weeping angels, etc.) there was a plentiful production.

Finally, French industry was successfully competing with Germany in respect of so-called '*art*' *porcelain*; it was producing biscuit porcelain in the Dresden style, small groups in miniature, series of animals in the Copenhagen style, sweetmeat boxes, etc. In order to do this, makers of porcelain were everywhere having recourse to female labor, for exemptions from military service were granted only in rare cases (except for the production of electrical porcelain).

Unfortunately this development was checked in 1917 by the scarcity of fuel; only the manufacture of goods for the army (electrical and chemical porcelain, etc.) remained active. The majority of the porcelain works of Limoges were obliged to abandon these new lines of manufacture and to confine themselves to commercial

or artistic table-ware, working only three days a week. One manufactory, however, of art and fancy porcelain was able to maintain its 1916 output and even to increase it, using only wood as fuel, though the price of the cubic meter had risen from 10 francs before the war to 35 or 40 francs. Makers of porcelain ornaments were immobilized by the lack of special hands and especially of coal.

Conditions were particularly serious in the Berry, where most of the porcelain works had had to close for want of coal—an unfortunate situation, for the industry lost touch with its customers and these obtained supplies elsewhere; the industry was one, moreover, that had had to meet, before the war, the keen competition of German manufacturers, working with modern plant, skilled technical assistance and, in consequence, at a lower cost of production.

At the end of 1917 the depression in the porcelain industry became more acute. The Inspector of the Limoges area reported that the registered personnel in the factories of the Limousin and the Berry (except such as were making chemical and electrical ware for defense purposes) had declined since January 1917. "This serious crisis," he said, "is due solely to lack of coal, for orders are pouring in both from France and abroad." The following summary (Table 79), which relates to the output of porcelain in a great manufacturing center, will enable the reader to compare the number of kilnfuls fired and the quantities of coal consumed in the several years, 1913 being taken as a normal year.

TABLE 79

	1913	1914	1915	1916	1917
Kilnfuls fired with coal	2,872	1,690	926	1,216	866
Kilnfuls fired with wood	218	94	17	40	103
Coal consumed (tons)	61,275	43,270	24,457	27,500	19,000
Wood consumed (cu. meters)	3,441	1,508	189	530	5,121

Thus, after the decline in the second half of 1914 (251 kilnfuls fired with coal as against 1,400), the years 1915 and 1916 showed an appreciable recovery; but the number of kilnfuls fell in 1917 by about 30 per cent. Orders nevertheless were numerous, and manufacturers had to sell their stock of defective ware. The demand both from home and abroad was principally for superior and tasteful

goods, and it was this demand that the manufacturers of Limoges endeavored to satisfy, with a reduced staff and smaller kilnfuls. One firm claimed to have refused, for lack of coal, a contract for 15 million dolls' heads, for delivery at the rate of 5 million a year and partly for export.

Factories were being brought up to date; some were still lit with paraffin lamps and were having their kaolin, ground on the banks of the Vienne, brought to them in ox-wagons. Six factories erected shops on their premises for the grinding of kaolin and enamel, which used to be done in separate works.

Manufactories of insulators and of chemical ware for defense purposes were busy at the end of 1917, being favored in the matter of fuel; some had trebled their output in less than a year, and those in the Lyons area had considerably developed.

Conditions remained the same in 1918, so far as porcelain factories working for civilian customers were concerned. Large firms had to confine themselves to a few kilnfuls a month, fired with wood, and only did this in order to be able to retain their hands. The output in the Berry was estimated at one-tenth of the normal. Electrical and chemical porcelain works, on the contrary, were fully occupied. One manufacturer had succeeded in making insulators capable of meeting a tension of 400,000 volts. Ordinary insulators were being made by women on small lathes of special design.

The depression in commercial, table, and art porcelain continued after the Armistice, owing to the lack of fuel and the difficulty of dispatching goods. At Limoges the number of kilnfuls had dropped, from an average of 225 or 250 before the war, to 83 in January 1918 and 73 in January 1919. The depression was even more serious in the Berry. Just when peace was about to bring a revival of business, manufacturers became apprehensive that the German industry, enjoying as it did every advantage, would drive them from the field, for Germany had cheap and plentiful raw materials, fuel, and labor, as well as perfect machinery and unrivaled organization; they accordingly asked for protective duties to enable them to maintain their position and in particular the new industry in dolls' heads. Their factories were old and inconvenient, and involved costly and useless transport between the works where different processes were carried on; the plant was indifferent, and there was a lack of chem-

ists and laboratories, defects which required a considerable effort to remedy.

The china decorating trade was receiving large orders, particularly from Switzerland, but was unable to execute them, for porcelain works were not supplying the raw material, and workmen, real artists in this case, were lacking. In 1920, the porcelain works of the Limousin were reported to be working normally.

The manufacture of *glass* was very seriously affected, during the war, by two different causes: (1) the areas that were invaded or threatened with invasion were the most important centers of production in France; the loss of the window-glass works of Aniche, of the plate glass works of Jeumont and of Saint-Gobain, and of the bottle factories of the whole area, was cruelly felt during four years. (2) Factories were short of labor, of means of transport, and above all of fuel; imports increased, exports declined, and it proved difficult to satisfy the requirements of the country, particularly in respect of window-glass.

The Carmaux glass-works (in the Tarn), which employed 780 workmen in July 1914, had 520 from the 1st August to the 1st October, and 630 on the 1st January 1915, the latter figure being reached thanks to the addition of some hundred refugees, mostly men, who by increasing the output of bottles, secured a normal and regular day's work for the female hands. The manufactory of cut glass at Baccarat had resumed work in January 1915.

Conditions in the glass industry, after a perceptible improvement at the beginning of 1915, remained stationary during the remainder of the year. Some works were reopened, but others were closed or hampered by scarcity of fuel. The lack of skilled hands checked the development of output, particularly as regards bottles and table glass. There is mention, however, of the reopening of a glass-works at Cognac with the help of foreign labor (30 men from Cuba and Buenos Aires), and of women, who proved satisfactory, especially at the molding machines. The window-glass factory at Peuchot (Aveyron) was stated to have its full staff; but the glass-works at Romilly-sur-Audelle had only two-thirds, and the cut-glass works at Baccarat one-third, of their normal numbers; while the decorated-glass works at Nancy had only a few old workmen for etching.

In most areas it was these difficulties alone that prevented a com-

plete recovery, for orders were generally plentiful. The output for the whole of the Paris area was estimated at one-half the normal. In the Dijon area conditions were unsatisfactory; one bottle factory out of three was still open, and was carrying on with difficulty; for the prohibition of the consumption of absinth had deprived it of a market for 40,000 bottles a day. As regards table glass, two factories in the Dijon area were working only for their sale-rooms, one of them for manufacturers of mustard, while the other had failed in its effort to resume production.

In spite of very numerous orders, especially for the drug trade, the Health Department, and the perfumery trade, which no longer had German competition to face, many goblet factories had to remain closed. Such factories as were at work were benefiting by the suspension of similar works in the north and east, but were selling their goods without guarantee of date, of delivery, or of price. Makers of optical glass in the Aisne suffered likewise from the prevailing difficulties. A manufactory of window-glass in the Ille-et-Vilaine, which had been able to recruit sufficient labor, undertook the production of lamp-glasses; these used to come from Germany, and had not been manufactured in France for several years. At the end of 1915 most of the glass-works at Nancy (all those making bottles, one making decorated glass, and one making table glass) remained closed; nor did they open during 1916; so that orders were transferred to the works in other departments. Optical glass manufacturers, making projector lenses for the army, were working ten hours a day; but an important factory in the Aisne was short of coal and was working only 7 or 8 hours a day on four days a week, its output being reduced by half.

Orders were again abundant in 1916, too much so in view of the difficulties already noticed; large orders for bottles, in particular, could not be executed. Employers made great efforts to obtain labor, bringing families from all parts of France to work in common; they increased the employment of female labor, trained apprentices in molding and blowing, and recruited Spanish workmen. It was found possible to reopen a few works, but others had to be closed for want of coal. A bottle-factory in the Dijon area had been hired and started by a manufacturer from Rheims, to relieve the depression prevailing in the Champagne wine trade

owing to the dearth of bottles. An important glass-works, which had hitherto been running with two shifts, had been able to add a third, thanks to a fresh contingent of workmen from South America.

As regards articles that used to be abundantly supplied by Germany, we find that the perfumery and drug trades were giving numerous orders for phials; that new factories were making lamp-glasses; and that the manufacture of electric bulbs was very active and was receiving orders for export. A plate glass factory was overwhelmed with orders from Government works and from explosive factories and had increased the number of its hands from 660 to 990. Factories working for the Health Department had more workwomen than in 1914, and manufactories of incandescent lamps were tending to supplant German and Austrian products; conditions in these factories and in those making insulators approached the normal during this year.

A window-glass factory, whose staff had increased by a third since 1914, had developed the special production of photographic glass for use from balloons and aeroplanes. Three window-glass factories were reported as having started work at the end of 1916; one of these, which had closed several years before the war, had 150 employees of both sexes; another had set five machines running out of eight, with 524 hands, including 128 women. There is also mention of one glass-works being converted into a steel-factory.

In 1917, besides the general difficulties already referred to, certain glass-works failed to obtain the fire-bricks they needed for the repair of their furnaces, all the output of the brick works being absorbed by the war industries. Such glass-works as remained open were reducing their staff or their volume of work: an important plate-glass factory, working solely for the army and overwhelmed with orders, was obliged to extinguish half its furnaces in January 1917, and was able to relight only one in April; some works had discharged half their personnel; one, which now had only 9 foremen for 79 hands (instead of 120), reduced the working hours to 9½; another had put out one of its two furnaces and was working only six hours a day. The bottle-factories of the Champagne area were paralyzed, and the output of bottles for sparkling wine, for which there was much demand abroad, was greatly reduced. A factory that used to produce 45,000 to 50,000 bottles a day before the war

was now making only 12,000. The output of phials was also below the normal. A cut-glass factory, with many orders from the perfumery trade, was lighting only two furnaces out of four. The calling up of skilled hands from certain glass-works entailed the discharge of the female staff. The export trade of a maker of simple glass-ware had fallen from 40 per cent before the war to 15 per cent of his total business; the exported goods went to South America.

There is mention, however, of a bottle-factory reopening with Spanish labor; a few makers of incandescent bulbs had started night-work afresh, or had increased their staff; and several works were beginning or developing the manufacture of articles formerly supplied by Germany: chimneys for gas-burners in imitation chromium glass; stained glass; photographic glass; beer-bottles; toughened glass for water-levels; optical glass; insulators and other electrical apparatus; and lamp-glasses. In order to make the latter, a factory had given up the production of 'cloches' (bell-glasses) for gardens, which requires very arduous work, suitable for grown men only, and which was not resumed until after the war. These various factories were also producing for export.

At the end of 1917 the transport crisis was affecting the supply of raw materials and the dispatch of manufactured goods. Bottles, in spite of the restricted output, were accumulating in the factories for want of railway-trucks; and yet there was an ample market for them, as most of the bottle-factories were situated in the territory occupied by the enemy or in the army zone. There was likewise a great demand for chemical and pharmaceutical glass, which used to come from Germany; in spite of this, several makers had had to stop work, partially or entirely; some were producing a third of their pre-war output. A factory working for the Pasteur Institute had only a third of its normal personnel, and a phial factory supplying the Health Department only 60 per cent. In a locality where the glass-makers were obtaining insufficient supplies of coal, they agreed that *three* among them should each fire one furnace and distribute the output among the customers of all.

Two firms undertook the production of rolled glass; a bottle-factory was making glass insulators for the Engineer and Postal services. A plate-glass factory was busily occupied with the manufacture of windows for motors and railway carriages, of reflectors,

periscopes, reinforced or figured rolled plate, roofing glass, pavement lights and tiles, lighthouse lenses, optical glass, water-levels made of toughened glass. Mirror works could get no adequate supply of labor, their raw materials were very scarce, they had ceased to export and, like glass-works, they could not even supply local requirements.

The position of glass-works remained, for the same reasons, equally unsatisfactory in 1918; some put out their furnaces after four months' work, instead of ten, the normal period, or suspended work for several months; others, being unable to employ more than a part of their equipment, had to let the remainder deteriorate; the maintenance of the kilns was neglected owing to the lack of furnace builders. Nevertheless the glass-works of the Loire are mentioned as being very busy: a manufactory of colored glass for railway signals was working normally; and certain factories which had been closed were able to reopen, having received a supply of coal. A manufactory of machine-made glass had increased its output, was about to undertake the production of rolled window-glass, and was enlarging its premises for the purpose. Mirror works were only moderately busy owing to lack of supplies; they were short of the sand required for beveling, formerly supplied by Germany, and of the benzene to make the varnish used in silvering. A large factory, the whole of whose output was assigned to war purposes, was being remodeled with a view to enlargement and more rapid production, but, owing to lack of coal, could fire only one furnace out of three. Mention is made of two large tank furnaces for rolled glass which remained alight, and of a mirror factory which, exceptionally, was working actively, with as many hands as before the war. The rest, being short of labor, had been obliged to suspend all exports.

After the Armistice a certain number of glass-works started their furnaces afresh. But those which used to work for the army, having lost their priority in the supply of fuel, were now subject to the same risks as the rest. One firm could not procure the refractory materials required for the construction of a second furnace, which would have provided work for demobilized men. Another was using one furnace out of three; others, which had converted their works into steel factories to meet war requirements, had closed their doors.

In contrast with the above, the reports mention a phial-factory in

course of construction. A firm had undertaken the production of rolled glass; by utilizing two casting-tables (only one was working so far) it hoped to have an output of one million square meters of glass a year from March 1919. An optical-glass factory, financed by the opticians of the area, was shortly to be started, to supply articles that formerly came from Germany. An important mirror factory had resumed work; after experiencing exceptional difficulties during the war, it was employing 200 hands from Belgium or northern France and replacing them as they left for their homes.

Work was abundant, during 1919, in glass-works: there was a great demand for bottles, window-glass, and articles of current use—lamp-glasses, tubes, and table glass, and it was impossible to execute all the orders. According to an employer, the personnel, most of it young, had been much tried by the war. There was still a dearth of raw materials and coal. Some factories had had to suspend operations for several months, and their workmen had gone elsewhere to look for more regular employment; others were utilizing only a part of their furnaces, and others again had closed.

Wages were high in the industry, and prices had risen in proportion; glass-works in the Rhine district were already offering bottles at a price much below that ruling in France. The export trade could not revive so long as output was not equal to the home demand.

Some firms are mentioned, however, which, thanks to better supplies, were able to work normally. Bottle-factories in the Tarn, near a coal-field, were more active than they had been since 1914. One of these, which had heavy orders, especially from Alsace-Lorraine, had increased its mechanical production and expected soon to have all its works fully occupied. A factory in Normandy had taken up the molding of opal glass, formerly a German specialty. The reopening is mentioned of a manufactory of window-glass, which was to employ 40 hands; of a manufactory of goblets and phials; and of a window-glass works with 300 hands. A firm was preparing to manufacture bottles, and several new works were being established in Normandy. In the liberated departments, some bottle and table-glass works, which had been closed since 1914, started one furnace apiece. A group of manufacturers in the Nord were expecting to

resume work shortly in such of their works as were not hopelessly damaged.

The position of the glass industry was variable in 1920. While there was activity in certain areas, others were still short of coal, of means of transport, and of skilled labor. A bottle-works was being erected, with glass-blowing machines; another, which had been closed since 1914, resumed work and proposed to enlarge its premises; another was increasing its mechanical equipment. A manufactory of rolled glass and of machine-made window-glass was working to its full capacity for the liberated region. The erection is mentioned of an important rolled-glass factory near Dijon, and work had been resumed in an optical-glass factory, closed since 1914; another factory was constructing two additional furnaces. But some firms had been idle, and the output of others was half what it had been before the war. Out of 23 glass-works in the Nancy district (8 champagne bottle factories, one ordinary bottle factory, 2 art-glass works, 11 table-glass works, and one cut-glass works) 11 were now running.

A large plate-glass factory was equipped so as easily to double its pre-war output; it had four furnaces alight, two for thin glass, and two for plate glass. Its output amounted to about 125,000 square meters of thin glass a month and 960 square meters of plate glass a day. It was using English coal exclusively, which cost more than ten times the pre-war price.

It may be mentioned here that the manufacture of *clinical thermometers*, formerly a German monopoly, had been proceeding throughout the war, with the assistance of German prisoners of war skilled in the process.

As regards the manufacture of *porcelain buttons*, there was a single factory in France before the war, at Briare in the Loiret, employing 700 hands. Germany was the chief producer of this article. This factory was reported at the end of 1915 as running with 590 hands, and as having many orders from English agents, which it could not execute for want of sufficient labor. Its personnel was increased in 1916, and it exported to India, where the German article was no longer available.

The manufacture of *glass beads* and *imitation pearls* was not jeopardized by the war. The reports mention at the end of 1915

that a factory at Montataire, which used to employ 62 hands, now had 80 workwomen, although the eastern market was practically closed.

A bead-factory, which had been closed *before* the outbreak of hostilities, was reported as reopening in the first quarter of 1916, with 41 hands of both sexes. This factory, which supplied beads for funeral wreaths, had more orders than it could carry out; at the end of the year its staff numbered 272. It continued to work in 1917, adapting its furnaces to wood fuel; but its output was reduced to one pot of glass a day, instead of four. At the end of that year it temporarily received the coal it needed and resumed its output. It is mentioned at this time that another bead-factory, which had 56 workwomen before the war, was now employing 138, and exporting its goods to America.

Conditions in the glass bead industry were good in 1918, especially since Venetian beads had ceased to reach the French market. The manager of an important bead- and button-factory writes: "Women have adapted themselves very well to the work since the re-arrangement of our furnaces, adopted in view of their cooperation. Three-fourths of the output is exported and replaces German and Austrian goods. These results have been attained only by replacing coal by wood as fuel."

It was stated, however, immediately after the war, that the manufacture of imitation pearls for export to India amounted to only 50 per cent of the pre-war quantity, and was threatened with complete extinction, owing to the loss of the supply of fish-scales from the Ukraine.

CHAPTER XIX

TRANSPORT

A FEW figures will explain the position of France before the war in the matter of land and inland water transport. As regards land transport we have to consider railways and motors; for the former, we refer the reader to the special volume in this series by M. Peschaud, but a few summary statistics relating to them may here be given.

France had been provided since 1840 with a network of main and branch lines of which the length actually operated was 50,900 kilometers. It held in this respect the third place among European countries, after Germany, which had 62,692 kilometers of track, and Russia, which had 61,861. In point of density of railways, France occupied the eighth place, with 9.5 kilometers of line per 100 square kilometers (roughly 2.3 miles per 100 square miles). The rolling-stock in 1912 comprised 13,828 locomotives and 405,824 carriages and trucks.

The war utterly disorganized the railway system and the rolling-stock. As early as August 1914 part of the northern and eastern lines fell into the enemy's hands, together with a considerable amount of rolling-stock. Moreover the displacements of the various productive agencies, the movements of population as a result of the invasion, and the inflow of the British and American military contingents, involved numerous alterations to track and stations. In order to reduce the congestion in certain centers on the Atlantic and Channel coasts, freight yards, sidings, and connections had to be multiplied. It may be said, generally, that dominating military requirements, connected with the movement of troops, their supply, and the manufacture of war material, entailed serious restrictions on the transport facilities available for civil industry and commerce. The Armistice likewise involved a heavy draft on the railway resources, in connection with the repatriation of prisoners of war and the demobilization of the allied armies. Moreover the destruction wrought by the enemy had been considerable: 3,300 kilometers of single track had been put out of action on the northern line, and

2,300 on the eastern. Rolling-stock had also been reduced to the extent shown below:

	<i>Available on 1 August 1914</i>	<i>Available on 1 January 1919</i>
Locomotives	13,800	14,574
Freight trucks	376,000	368,683
Passenger carriages and luggage vans	49,320	43,956

Appendix XXXIX will illustrate the position; it shows the commercial traffic (military traffic excluded) on the principal lines during the war. It will be observed that the Eastern Company was unable to furnish figures of its traffic for 1914, as some of its stations were within the invaded area, and that the P.L.M. did not keep traffic statistics during the years 1914 to 1918.

The war brought about a very remarkable development of *motor transport*. The vehicles placed under the control of the military authorities carried, from August 1914 to December 1918,

25,928,922 tons of material,
23,543,979 N.C.O.'s and men,
10,411,156 sick and wounded,
1,566,329 tons of meat.

The military motor transport service comprised at the Armistice 59,069 vehicles (23,571 of which were lorries); and to these must be added 24,069 artillery motors and 13,946 aviation motors; in all more than 97,000 vehicles. At the moment of the attack on Verdun, as many as 6,000 motors passed a single point in that area in 24 hours; and on the Somme, at the time of the last German offensive, motor traffic reached at certain points an intensity of one vehicle in every 4 seconds.

Civilian motor transport showed little development during the war, though there was some increase in the construction and use of motor lorries, stimulated as they were by the requisitioning of horses. At the end of the war, the sale of numerous motors belonging to the French and American armies resulted in a considerable increase in civilian motor traffic, both as regards lorries and other carriages; motor manufacture also showed great development in 1920.

Inland water transport, like railways, has been dealt with in a

special volume of this series. The position before the war may be briefly stated as follows: in 1913 the total length of navigable water-ways was 4,875 kilometers; these water-ways had mooring space at least two meters wide outside the fairway, and locks 38 m. 50 by 5 m. 20 of capacity. Of the total, rivers accounted for 2,128 kilometers, and canals for 2,747 kilometers. The total weight of goods transported on these water-ways amounted in 1913 to 42,038,695 tons. Moreover the water-ways crossing the north-eastern frontier carried a considerable international traffic, as the figures of Table 80 show.

TABLE 80

	<i>Imports tons</i>	<i>Exports tons</i>	<i>Total traffic tons</i>
From Belgium	2,695,772	1,422,058	4,117,830
To Belgium			
From Germany	889,094	557,049	1,446,143
To Germany			
<i>Totals</i>	3,584,866	1,979,107	5,563,973

As regards river ports, that of Paris came first—it likewise outstripped all the maritime ports—with a total goods traffic, in 1913, of 15,208,085 tons. Next after it came Rouen, Vigneux, Villeneuve-le-Roi, etc. There were in 1912 15,141 river- and canal-boats, of which the largest had a carrying capacity of 4,035 tons; and the commercial traffic carried by these amounted in 1913 to 6,185 millions of kilometer-tons.

The war did not bring the current work of canal construction to a complete standstill. The excavation of the canal from Marseilles to the Rhône was never interrupted; but violent fighting took place round the works of the new northern canal. It had at first been thought that the water-ways would be of little service in case of war, owing to the slow speed of water transport; and the port of Paris easily handled the 244,137 tons which were to be carried there under the mobilization scheme. But as the war dragged on and rail transport became increasingly difficult, Government directed its attention to the employment of water transport on a large scale, and various measures were taken to this end: agreements were entered into with

transport contractors to settle freight rates and to check their rise; 9,107 mobilized men were recalled from the front; boats were built or repaired; water-ways were improved; lights were put up to permit navigation by night, etc. The figures of Table 81 show the quantity of goods transported by water-ways during the war years (excluding as regards those years water-ways occupied by the enemy, those situated in the army zone, and those exclusively under military administration).

TABLE 81

	<i>Tonnage carried (millions of tons)</i>	<i>Length of water-ways in use (kilometers)</i>	<i>Tonnage carried between Rouen and Paris (millions of tons)</i>
1913	23,917	9,346	3,491
1914	15,142	9,395	3,087
1915	13,220	9,147	5,182
1916	15,142	9,118	6,206
1917	16,076	9,305	6,360
1918	18,150	....	7,254

The figures of traffic between Rouen and Paris have been shown separately, because it was there that the chief development in water-borne traffic took place. The Lower Seine contributed greatly to relieve the situation, by facilitating the supply of coal to the Paris district. It should also be remembered that the network of water-ways in the north of France was the scene of much fighting and suffered frequent and severe damage; and that this was further aggravated by the destruction wrought by the Germans when they withdrew.

We will close this brief survey with a few remarks concerning the maritime ports and sea-transport. French ports had been considerably improved, since 1871, to meet the requirements of modern shipping. The Freyeinet scheme and the subsequent Baudin scheme were nearly completed on the eve of the war, and important projects were in course of execution at Dunkirk, Havre, Saint-Nazaire, Bordeaux, and Marseilles. The war did not interrupt them at all: at Dunkirk, 1,300 meters of new quays were brought into use; at Havre, 480 meters of quays were completed, 500 meters were constructed, and the breakwater was finished; at Rouen, the works at

the Ile Elie were carried on by which 713 meters of new quays were added; the Homet jetty at Dunkirk was put in order; the Quai des Darses at Saint-Nazaire was brought into use, providing 388 meters of new wharfage; at Bordeaux 210 meters of quays were completed, and the important wharves of Bassens were built; at Marseilles work was continued on the excavation of the Président Wilson dock and on the prolongation of the moles, and 1,230 meters of new quays were made available. Wharfage was built or extended in a large number of small ports, such as Blaye, Tonnay-Charente, etc. Mechanical appliances, cranes, etc., were much increased.

The French mercantile marine had been far outstripped before the war by the shipping of other countries, where development during the previous fifty years had been much more rapid. In 1913 imports through French ports had amounted to 30,193,000 tons and exports to 7,717,000 tons, a balance of 22,476,000 tons in favour of imports. The share of French shipping in carrying the above had been only 22.5 per cent of the imports and 48.8 per cent of the exports. The mercantile marine was further weakened during the war owing to the destruction of ships by submarines, with the result that freights rose to an extraordinary extent, a matter that has already been dealt with in Chapter IV, page 78. Table 82 gives the tonnage of French mercantile shipping existing on the 31st December of each year from 1913 to 1919.

TABLE 82

	<i>Net tonnage¹ in thousands of tons</i>		<i>Tonnage (in thousands of tons) of French sailing ships and steamers built in France and brought into service during the year</i>
	<i>Sailing ships</i>	<i>Steamers</i>	
1913	602	980	176
1914	586	1,040	114
1915	561	1,066	25
1916	520	1,028	43
1917	417	886	19
1918	409	850	14
1919	427	879	33

¹ Net tonnage represents about 80 per cent of gross tonnage for sailing ships, and 50 per cent for steamers.

Appendix XL shows the movement of commercial shipping in the principal French ports during the years of the war, and the following figures give the countries of origin of the goods that entered France by sea during 1913:

From Great Britain	54 per cent of the tonnage
From other European and Mediter- ranean countries	25 per cent of the tonnage
From distant countries	21 per cent of the tonnage
<i>Total</i>	100 per cent

Of the exports (7,717,000 tons)

31 per cent went to Great Britain,
15 per cent went to Algeria and Tunisia,
36 per cent went to other European and Mediterranean countries,
18 per cent went to distant countries.

Finally, the need for vast quantities of imports during the war revealed the total inadequacy of the facilities for moving goods from the ports inland. A great effort was accordingly made to improve the canals, and more especially the railways (as quicker to construct), by which the ports could be cleared and connection established between the quays and the railway system. The principal ports that were improved in this manner were Dunkirk, Calais, Boulogne, Havre, Rouen, Brest, Nantes, Bordeaux, Bassens, and Marseilles. The French Engineer Service and the American and British armies constructed altogether about 1,000 kilometers of railway track, to insure the regular flow into the interior of goods arriving by sea at the ports.

Table 83 gives the index-numbers for the Transport industry of (1) the establishments at work, and (2) the personnel employed, at the dates of the several inquiries; *they exclude railway, inland water-way, and sea-transport*, and relate, in fact, mainly to the handling and storage of goods.

The returns for January 1920, which relate to the entire French territory, give the following index-numbers: for establishments, 97; for personnel employed, 117. The figures point to a fairly rapid reorganization of the industry, followed by great activity; from

TABLE 83

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	64	46
Oct., 1914	74	51
Jan., 1915	75	63
July, 1915	79	79
Jan., 1916	85	90
July, 1916	89	96
Jan., 1917	83	98
July, 1917	87	97
Jan., 1918	87	100
July, 1918	94	98
Jan., 1919	86	105

1917 onward the industry was as busy as, or more busy than, before the war.

Commercial and industrial transport was seriously affected by the mobilization. Facilities were reduced to a minimum as a result of the calling up of drivers and other labor, and of the requisitions of horses and vehicles by the military authorities; as a result also of the control of communication, imposed in the higher interests of the country. At the ports, loading and discharging were completely disorganized; the number of lorry-drivers available was reduced by about a third, and of dock hands by one-half.

The scarcity of labor was much felt in 1915, and the reports state that the ports were badly congested in consequence. At Calais, merchants engaged in the transit trade were obliged to restrict their operations; at Rouen, the various services of the port were without labor, and the lack of available space led to the rapid congestion of the quays. As a remedy, contractors were allowed, experimentally, to employ prisoners of war, not only in the above ports but also at Dieppe and Nantes. At Brest, the maritime authorities had to supply labor for discharging vessels; at Bordeaux, Moroccans and Algerians had been brought in, but in insufficient numbers. Prisoners of war were employed also at Marseilles, but there the dearth of labor was aggravated by that of vehicles, resulting from the organization of the port where there is a large

transit of goods; the quays were encumbered and vessels had to wait a certain time before they could be berthed.

The reports state that in the second half of 1915 the problem of labor supply had been practically solved at Bordeaux by the employment of prisoners of war and foreign hands; but complaints continued unabated in other areas. The port of Cette, which is usually extremely quiet, broke into feverish activity as a result of the constant arrival of cargoes of cereals and of wine in barrels; all available dock hands were employed, and these were reinforced by numerous porters recruited in Spain and by German prisoners; in spite of this the quays were still encumbered with goods. Although the congestion was somewhat reduced at Marseilles, the available means of transport remained inadequate, and transport contractors were short especially of skilled labor. They were employing 5,500 dock hands, 1,000 to 1,100 coal trimmers, and 3,000 prisoners of war; the labor of three of the latter was estimated to be equal to that of two dock hands. The shortage of leading stevedores was especially felt, as these were the only men accustomed to direct the work so as to get the best results.

At the end of 1915 storage and transport contractors were still without labor and horses, and business suffered in consequence, particularly in the wine trade. There was extraordinary activity on the quays of all the ports, but the labor supply was very irregular. The reports state that some of the workmen were earning such wages that they would only work a few days a week. There were also complaints of the lack of skilled labor, to take charge of tackles, etc. At Bordeaux, the labor supply was composed to the extent of two-thirds of Spaniards and Moroccans; at Rouen, the employment of prisoners of war was constantly developing; at Marseilles, on the contrary, it was diminishing and only 1,400 or 1,500 prisoners were at work; and although contractors were resorting to the labor of Italians, Kabyls, Spaniards, and prisoners, as well as of Frenchmen, goods remained a long time on the quays, because of the lack of railway-trucks and of lorries. English dock hands were called in at Dunkirk and Calais.

In 1916 land transport continued to be much impeded by the want of men, horses, and vehicles. In a few garrison towns certain transport contractors were enabled to get their goods handled

thanks to the loan of military labor from the regimental depots. The activity of the ports was hindered by the lack of railway-trucks, and in certain places by shortage of berthing space and inadequate facilities for discharging. Women and children had been engaged at Rouen and Nantes for transport work: barrels were conveyed from the quays to the storehouses on frames drawn by mules, and these were driven by women and children; the handling of the barrels was still done by men. Some slight improvement in the situation was reported as a result of the employment of women, foreigners, and prisoners of war. The recruiting of young people from 15 to 18, who could earn 7 to 8 francs a day in this trade, was having an unfavorable effect on the supply of apprentices. Employers complained both of the inadequate quantity and of the defective quality of the labor available; two laborers, according to them, scarcely did as much work as one did before the war (the laborers now including prisoners, foreign and colonial workmen, and women). Omnibus companies and similar undertakings employed women largely, from the first, on their vehicles; and women were subsequently given work, in the depots, on washing and cleaning.

The transport problem at the end of 1916 dominated the whole industrial and commercial situation, and checked the activity of every kind of enterprise. In order to remedy the deficiency of railway facilities, road transport and especially motor haulage were developed, and in certain centers regular services were organized to ply between the localities in a given radius. Children took the place of men for driving horses, and women even drove motor lorries.

During 1917, there was great demand for the transport and handling of goods, and firms engaged in the trade were unable to satisfy their customers; and yet the number of establishments at work and of personnel employed was little less than before the war. But they lacked facilities, and labor could be recruited only with difficulty in spite of the high wages offered. To replace the men called up, recourse was had, in a constantly increasing measure, to women, lads of 16 to 18, foreign and colonial hands, and their output of work was less than that of men trained in the trade.

The motor-lorry transport services, plying round the large centers of population, went on developing and proved extremely useful. Unfortunately, shortage of petrol obliged some of the motor-

bus services to shorten their routes, sometimes even to stop altogether. A great firm of taxi-cab proprietors saw the number of its drivers reduced almost to nothing, as the result of successive calls to the colors. Certain tramway companies had their cars run almost exclusively by women; others resorted to the employment of young lads of 16 to 18, and to disabled soldiers, whose labor also proved satisfactory. On the other hand, carriage by horse conveyance was difficult and costly. It was hard to obtain the materials required for the repair or maintenance of the vehicles in use; in one large center there were absolutely no wheelwrights or smiths in 1917 to repair the civilian conveyances employed for industrial, commercial, and agricultural purposes. The Economic Committee of the 17th region, after inquiry by the Inspectorate, applied itself to obtaining from the military authorities the provisional release of a few of these craftsmen.

Water transport was developed, and its equipment improved, in 1917, in order to alleviate the scarcity of railway facilities. Mention is made of a new experimental service between Paris and Nancy, and of the organization, by agreement between the Chambers of Commerce of the south-west, of a more frequent boat service on the Midi canal, on the Baise (the canal lateral to the Garonne), and on the canal from Cette to Beaucaire; the navigation of the Tarn, which had hitherto been difficult, was improved by the same agency, so that boats could travel direct from Bordeaux to Beaucaire. In another port, five new businesses were started by Belgians, with Belgian workmen, for discharging and forwarding merchandise. A new shipping company began the construction, toward the end of 1917, of a considerable number of boats of modern design. Two companies doing import and forwarding business were setting up boat-building and repairing yards in the vicinity of a great river port.

As regards the discharging of vessels in ports, it was found possible in 1917 to utilize female labor, for handling goods of moderate weight; the labor of prisoners of war, and likewise that of Algerians and Spaniards, proved very unsatisfactory, although their wages had been considerably raised: they were paid, for a nine-hour day, 8 francs, 10 francs, 12 francs, and even more. There

was, it may be added, some relaxation in dock hands' work in certain ports, owing to the reduced number of vessels arriving.

The year 1918 saw some development of the various methods of grappling with the congestion of means of transport. The motor services radiating from the great towns were multiplied so far as the supply of petrol permitted. A regular service was maintained in the Marseilles area and the south-east; and from the 1st July 1918 onward the motor connections of the P.L.M. were resumed, especially in the Alpine region. Similarly, transport by horse vehicle was increased, so far as was possible in view of the prevailing scarcity and high price of horses and of forage and corn.

Commercial transport by rail was particularly hampered in 1918 by military requirements, and water transport was developed in consequence. In certain river ports, transport companies opened new yards where their boats might be built and repaired, and obtained certain privileges in this connection: prisoners of war were allotted to them, and their goods had priority of transport. River services were also busy on the Rhône, from Lyons to Beaucaire, and on the Saône. Certain great Paris shops had established entrepôts at Lyons, on the quays of the Saône, as part of their water transport arrangements; here their goods were collected and then forwarded to Paris by river. A river transport company had eight steamers and eight tugs constantly in use, solely for goods dispatched from or arriving at Lyons. Goods were handled mainly by women: 220 of them were employed on the quays of the Saône, loading and discharging vessels, and 70 among these were specially employed in charge of boats and lighters. There were still however serious deficiencies which impeded a better utilization of the natural water-ways: the number of boats was inadequate, and they called only at the more important towns—Valence, Avignon, Beaucaire, and Arles; there was no tackle, or not enough, in the ports. Tugs and barges were needed (some were being built of reinforced concrete for lack of wood); there was need of improvement in ports and their equipment, and of connections between the ports and the railways; sheds were wanted; and it was desirable to have both direct services and omnibus services stopping at the small ports. Each of the little ports on the Rhône could furnish a considerable tonnage of lime and cement, plaster, ochre, fertilizers, chemicals, wine,

cement slabs, cast iron, paper, cardboard, leather, bottles, etc. It would moreover have been advantageous to utilize this method of transport for corn, flour, hides, barrels, and commercial produce generally.

In the maritime ports conditions were irregular in 1918; though some of them continued busy—for instance, Cette, Nantes, the ports of Normandy, and Calais—work diminished a good deal in others. Dunkirk, as a result of the bombardments, received scarcely anything beyond war material and coal, and its quays were deserted; a large proportion of the dock hands had been evacuated. Labor was still in short supply, and plant was in a very bad state for want of repairs. Appendix XL, which shows the movement of shipping at the principal ports during the war, may be consulted in this connection.

In the overcrowded towns, the tramways, much worn and out of repair, had great difficulty in giving a minimum service; rails for the maintenance of the tracks had become almost unprocurable; the employment of women was general.

After the Armistice, at the end of 1918 and in the early months of 1919, there was no improvement in conditions so far as railways were concerned; and other means of transport presented the same features and were subject to the same impediments as before. However, the submarine campaign was at an end and no longer hindered trade; on the other hand imports of war material for the allied armies diminished. Dock hands were busy in the south, as a result of the revival of intercourse with the countries round the Mediterranean. Several ports on the north coast were reserved for allied traffic, and this was conducted by allied labor. Motor haulage developed under the stimulus of the measure by which free trade in mineral oils was restored; the sale of army lorries, and the return of demobilized drivers, offered facilities to contractors. Several companies were formed to carry on motor services between Paris and the devastated area. An important company increased its capital and had vast premises erected comprising garages, underground petrol tanks, repair shops, etc. The price of motor haulage was 2 francs the kilometer-ton.

The end of 1919 and the beginning of 1920 saw a continuance of previous conditions: the disorganization of rail transport persisted,

though in a less acute form. To make good the deficiency in railway facilities, the use of motor haulage was generalized in spite of its high price. In addition to the development of motor transport businesses, there was a marked increase in the number of private motor lorries in use: all the great commercial houses undertook their own supply and delivery services. In order to obviate the partial utilization of vehicles and empty return journeys, a commercial office was organized in each area to centralize information about opportunities of transport and enable all manufacturers to take advantage of them. Motor haulage, which was useful mainly for communications within a department, or between one department and the next, was occasionally extended to great distances: lorries for instance would bring wine from the south of France to a district in the center. It was used also for urban communications, and proved advantageous in view of the dearth of horses and the high price of corn and forage. Traffic by water was also active. Mines and metallurgical factories made an increased use of river navigation, and developed the river ports; manufacturers were anxiously awaiting the completion of the canal from the Rhône to the Rhine. It was decided to install electric haulage of boats on the Marne-Rhine canal and on the Houillères canal.

The handling and storage of goods in the northern ports resumed their pre-war activity and employed a large number of workmen. Exports were small in quantity, but the tonnage of imports was so great that the quays were congested.

CHAPTER XX

MISCELLANEOUS TRADES

THE wholesale trade in the various categories of products has already been dealt with in the preceding chapters treating of their manufacture; and we have given in the Appendices a table for each group, to which the reader may refer, showing the import and export trade.

Similarly, information in regard to the chief products of agriculture may be obtained from M. Augé-Laribé's monograph on that subject. And separate works by M. Clémentel deal with France's wholesale and general trade during the war. Indeed 'French industry' was deliberately chosen as the title of the present volume, and, in principle, we are not here concerned with commerce. We may however offer a few remarks on the various occupations that are generally classed among Miscellaneous Trades and are at the same time industries: hotels and restaurants, entertainments, the bottling and dispatch of natural mineral waters, rag-sorting, and even banking and insurance; for the line between commerce and industry is ill-defined. If we add a few summary notes on retail trade during the war, it is because the reports of the Labor Inspectors contain some interesting information in regard thereto, which throws light on the life of the working classes and does not appear to fall within the scope of any other volume of this series.

The *hotel industry* is of great importance because its interests are bound up with those of all the other industries. It is, in fact, the foundation of all sales to foreigners—of 'export at home.' If French hotels attract and retain a considerable number of foreign visitors, the public wealth of the whole country is thereby increased.

Before the war Paris hotels used to receive yearly from 400,000 to 500,000 foreign, against 700,000 French visitors, and it was calculated that the 25,000 hotels in France represented a value of a milliard francs. But their staff was very largely composed of foreigners. In 1912 only 57 per cent of the principal hotels in France were managed by Frenchmen, and only 35 per cent of those on the Riviera. The subordinate staff was mainly German, Swiss, and

Italian. On the Riviera, where the proportion of foreign employees was highest, the staff of 600 seasonal hotels comprised 60 per cent of Germans, 20 per cent of Swiss, 10 per cent of Italians, and only 10 per cent of Frenchmen.

As regards spas and health resorts and the mineral water industry, it was estimated before the war that persons frequenting the former spent there yearly, at baths, hotels, and casinos, 150 million francs. The number of persons taking the waters at the principal spas was as follows:

Vichy	70,000
Évian	15,000
Vittel	12,000
Aix	10,000
La Bourboule	8,000

In Germany, on the other hand, the spas with a visiting population of 20,000 were numerous, and these people spent in the aggregate 800 million francs a year. For Germany had methodically developed her watering-places, whose curative properties were not superior to those of the French spas, by advertisement, attention to installation and comfort, to the medical personnel, and so forth.

The French *mineral water industry* gave rise to an active foreign trade. In 1913 France exported 376,557 quintals¹ of mineral waters, valued at 7,531,140 francs, distributed as follows:

Vichy water	236,657 quintals
Périer water	43,122 quintals
Vittel water	26,083 quintals
Contrexéville water	12,616 quintals
Saint Yonne water	12,126 quintals
Vals water	5,072 quintals
Évian water	4,002 quintals
etc.	etc.

Imports of mineral waters, principally purgative, amounted to only 168,333 quintals, valued at 3,366,660 francs, or deducting Évian water, to 53,364 quintals, valued at about 1,100,000 francs, distributed as follows:

¹ Quintal = 220 lbs.

	Évian	114,969 quintals
Purgative waters	{ Hunyadi János	16,345 quintals
	{ Rubinat	11,006 quintals
	{ Carabana	2,699 quintals
Table waters	{ Soda water	8,119 quintals
	{ Apollinaris	3,952 quintals

The credit accorded by *Banks* to commercial enterprises contributes greatly to their development. Before the war the great industries had little difficulty in obtaining the financial accommodation that they required, but the small and medium industries suffered in a special degree from the insufficiency of their financial resources and from the French banking system. The considerable development of deposit banks in Paris had brought about the disappearance of numerous local and regional banks, whose support was indispensable to small manufacturers; these local banks granted long term loans to industrial firms or took shares in their business. The great deposit banks, on the other hand, played an important part in the country's economy: they helped to moderate and stabilize the rate of discount, and above all they gave valuable assistance in connection with national loans and the *Crédit Foncier* and City of Paris issues. As for the regional banks, the extent to which the industrial activity of an area can be built up and stimulated by their support may be seen from a few examples. In Lorraine, for instance, metallurgy had made extraordinary progress with the assistance of regional credit. The discovery and the subsequent development of the Briey mines, the extraction of iron-ore which increased tenfold, and the production of cast iron which quadrupled, in a score or two of years, all this progress in the utilization of mineral wealth required a large amount of capital. Capital was also needed for the subsidiary branches of the great iron and steel industry: engineering and electrical shops, power-stations, workmen's dwellings, breweries, flour-mills, etc. The banks of Lorraine created these prosperous conditions by means of their own credit, and later by that of their depositors, in whom confidence was instilled by a long process of education. "Between 1900 and 1913 the banks of Lorraine had issued and disposed of debentures to the value of 250 million

francs.”¹ In the northern area the banks had supported industry on an equally vast scale; and we may, by way of illustration, add a few words regarding the assistance given to local industry, both before and during the war, by the regional banks of the Dauphiné. Twenty years before the war, Grenoble possessed a few silk-mills, branches of the great Lyons factories; a few paper-mills, and the glove trade which was the specialty of the place. The banks transformed the locality and created, what was a new industry in France, the utilization of water-power. The first conduits for conveying the power of high waterfalls were constructed in the valley of the Grésivaudan. The obstacle of distance to the transmission of large forces was overcome for the first time between Vizille and Grenoble, and there also electro-chemistry was developed. The utilization of the hydraulic forces of the district was methodically extended, with excellent results, but at the cost of hundreds of millions of francs. The Lyons banks and the Association of Provincial Banks gave powerful assistance, but both in the Dauphiné and in Savoy local funds, under the influence of the bankers, contributed largely. Between 1908 and 1914 the Charpenay Bank invested 28,420,000 francs in water-power; the Banque du Dauphiné took part in fourteen issues of stock; the Lyons and Grenoble private bank in fifteen issues; and the Laydernier Bank in five issues. In doing this they rendered an immense service to the district and to the whole of France: for it was largely owing to water-power that France was able, during the war, to overcome the coal famine and to make the gigantic industrial effort which the continuance of the struggle entailed. Even while hostilities proceeded, French engineers, with the assistance of the banks and especially of the local banks, successfully undertook new works, in spite of difficulties connected with labor and transport.

After the battle of the Marne, when industry was called upon to supply the guns and munitions that were lacking, the Grenoble factories, thanks to water-power, were ready to go ahead without English coal. In this period of fierce activity, many were the discoveries made: synthetic casting, electro-metallurgy, electrolytic iron tubing. New turbines representing 565,000 h.p. were installed, and

¹ Rapport général sur l'Industrie Française.

305,000 h.p. was supplied by the Alps. Paper-mills were reopened and shells of all calibers up to 420 millimeters were turned out by engineering works. Explosives were prepared by electro-chemical processes, weaving-looms made artillery cartridges, aeroplane fabric, and finally even wove wool for the invaded area. No doubt the Government gave financial assistance to all these factories. But it was mainly because the banks had revealed, not only to the district but to French capitalists in general, the extraordinary resources of water-power, that the Dauphiné was able during the war to devote 160 million francs to electric power, 55 millions to electro-chemistry, 98 millions to electro-metallurgy, or in all 313 millions to new industrial processes.

Entertainment businesses, which had been many and prosperous, were severely tried by the war. Actors and artistes left in large numbers to join the colors, and the public were too much occupied with current events to furnish any regular demand for tickets. Cinemas, whose numbers constantly increased, tended more and more to replace other kinds of entertainment. This industry before the war provided a home market for cinematographic cameras and projectors to the value of 2 million francs; there was foreign competition (from Germany and England) only in respect of projectors, and (from Germany) in respect of toy cinemas. But by far the most important question was that of films.

In 1913 France was a large importer of unexposed negative films; there was only one French producer of films. France imported in addition 61 tons of films. As regards reels of positive film for cinemas, printed or not, French imports had increased from 102 tons, worth 9,334,000 francs in 1910, to 214 tons, worth 22,916,000 francs in 1913; and exports had increased from 73 tons, worth 6,681,000 francs, to 347 tons, worth 33,199,000 francs. Italy and America were the principal sources of supply. (See Appendix XXIX for the foreign trade in cinema reels during the war.)

The following are the figures of the gross receipts of the Paris theaters and other entertainments (concerts, music-halls, dancing-saloons, cinemas, etc.) encashed for the Poor Tax before, during, and after the war:

	<i>Francs</i>		<i>Francs</i>
1900	57,923,640	1915	23,744,686
1905	41,933,968	1916	46,389,421
1910	56,797,735	1917	62,936,863
1911	58,762,484	1918	80,218,861
1912	65,492,992	1919	148,471,329
1913	68,452,395	1920	219,455,194
1914	41,606,315		

The gross receipt of 219,455,194 francs for the year 1920 was composed as follows:

	<i>Francs</i>
Subsidized theaters	22,786,583
Theaters	64,486,243
Concerts and 'cafés-concerts'	25,601,113
Music-halls	19,957,585
Circuses, rinks, dancing-halls	15,853,151
Museums	1,102,214
Private concerts	891,871
Cinemas	68,776,431
	<hr/>
	229,831,587

We may add, by way of general illustration, that the index-numbers of establishments open and of personnel employed at the dates of the several inquiries by the Labor Inspectors were as shown in Table 84.

TABLE 84

	<i>Number of establishments at work</i>	<i>Personnel employed</i>
July, 1914	100	100
Aug., 1914	75	49
Oct., 1914	80	52
Jan., 1915	79	56
July, 1915	83	62
Jan., 1916	87	68
July, 1916	86	70
Jan., 1917	86	70
July, 1917	89	72
Jan., 1918	91	72
July, 1918	91	73

The returns for January 1920, relating to the entire French territory, give as index-numbers: for establishments, 94; for personnel, 87. It will be seen that the miscellaneous trades, while losing one-half of their personnel, kept three-quarters of their establishments open in August 1914, and that their position steadily improved until, in 1918, a nearly normal number of establishments were open, with three-fourths of the normal staff. Although these index-numbers relate to the whole group of "Miscellaneous industries," we shall confine ourselves in what follows to the few subjects that have been mentioned above.

The majority of these industries, during the last months of 1914, experienced an active demand from a clientele of men called to the colors, supplemented everywhere in some degree by refugees, and in the northern and western districts by British and Belgian soldiers. This was especially so as regards *Hotels, cafés, and restaurants*. In certain garrison towns where customers were particularly numerous, the male staff was replaced by women, children, and old men. The large hotels in watering-places, which nearly all closed on the declaration of war, were turned into hospitals and ambulances. A few, however, especially in the Basses-Pyrénées, were busy in August and September, owing to the arrival of refugees, but the number of their visitors rapidly diminished. Hotels usually frequented by commercial travelers were practically deserted.

In 1915 the season at the eastern spas was a bad one. At the spas of the Pyrenees, particularly at Luchon, it was indifferent, but better than had been expected, the principal hotels having been requisitioned; it lasted, at Vichy, only from the 14th July to the 15th September, and only the villas and small hotels were open. In the Limoges area, out of 282 establishments situated at the spas and comprised in the statistics, which used to employ a staff of 4,585, only 148 were opened during the season, with 1,755 employés. On the Riviera the autumn season of 1915 was more prosperous. Conditions had not improved in commercial hotels. On the other hand officers in considerable numbers still frequented the hotels in the army zone, and the staff of these was often overworked.

Hotels were again seriously affected by the war conditions in 1916, especially the very expensive hotels and commercial travel-

ers' houses. Even in garrison towns outside the army zone, clients had become less numerous. A slight improvement was however reported in the hotels of some Riviera towns, which attracted a certain number of officers and their families. Restaurant-keepers also enjoyed a favored position in towns where important war industries were located, and the reports mention the opening of many new restaurants in the neighborhood of large factories. Among spas and health resorts, Lourdes and Biarritz were mentioned as particularly affected since the outbreak of war. The foreign employees of certain large hotels had not been replaced, and yet the remaining staff, which was needed for the upkeep of the buildings and plant, was larger than the service of the guests required. Nevertheless, with a view to the future, hotel-keepers had obtained the establishment of a hotel section in the training schools at Tarbes and Pau. There was some revival at Vichy, where a few hotels had been given up by the military authorities. On the 15th July 1913 36,000 persons were registered as taking the waters; on the same date in 1914, 24,000; in 1915, 10,000; and in 1916, 13,723.

It was found at the end of the year that the season of 1916 had been fairly good, in general, at seaside and health resorts, and at spas. In a few of these, in the center of France, pre-war conditions had nearly been restored; Nérès had 5,700 visitors against 4,781 in 1913; Bourbon-l'Archambault, 1,050 against 1,300. Others still fell far short of those conditions: Vichy had had 42,000 visitors against 108,963; Évian, 250 against 1,234. The surrender by the Health Department of a number of requisitioned hotels gave ground for hoping for a good season in 1917. On the Riviera foreign visitors were still scarce.

In 1917 hotels and restaurants in the large towns were well frequented, though somewhat less so than in peace-time; in the smaller towns, they suffered severely from the course of events; some even had to close owing to the constant rise in the price of food-stuffs. Establishments situated near the front remained full and were moderately prosperous, in spite of the extraordinary rise in prices in those localities.

At the end of the year hotels and restaurants in certain areas (Lyons and Marseilles) had numerous customers. The male staff had nearly everywhere been replaced by women. The watering-

places and spas had a satisfactory season, and at some of them the number of visitors showed a perceptible increase. Vichy, which had had 110,000 in 1913, 30,000 in 1915, 41,000 in 1916, had more than 50,000 visitors in 1917. Bourbon and Nérès reached their normal figures, and Mont Dore, 70 per cent of the normal.

In 1918 the winter season in the Riviera, which had been momentarily imperiled by the events in Italy, continued and terminated very successfully, as a result of the influx of Parisian visitors, and lasted longer than usual. In the south-east and in the Alps, seaside and health resorts were busy for a considerable period; villas and hotel rooms had almost all been reserved as early as the spring. The hotel industry naturally profited by this abundance of visitors, and was remarkably prosperous in 1918, not only in the above districts but in many other centers, especially at the moment of the influx of refugees from the bombardments. Many localities became overcrowded, new restaurants were opened, and prices doubled. Nevertheless hotel-keepers complained that these customers, who had been residential rather than transitory, had not yielded as much profit as had been hoped.

The allied armies hired most of the hotels and restaurants still available in the areas that they occupied, either to lodge their officers and men or to install their services. This was a profitable arrangement for the hotel-keeper, but highly inconvenient for the traveler. The prices asked were often exorbitant, but these new clients, where their comfort was concerned, seemed frequently to lose all reasonable idea of the value of money. Hotel-keepers, on the other hand, complained of the difficulty of obtaining supplies, crockery, glass, and linen, and of the unduly high price of wine.

Conditions were excellent at the beginning of January 1919, for in lieu of the usual dead season, all the hotels in the health resorts were open and occupied by officers and men of the American army on leave. The influx of the same visitors had secured a good season for the hotel-keepers of the Riviera. Restaurant-keepers, who had been obliged to resort to female labor with somewhat unsatisfactory results, were re-engaging male employees as these were demobilized; cooks moreover were less scarce than they had been. During 1919 the receipts of hotels and restaurants were high; for the price of meals and rooms had risen further. In the department of the

Marne they were employing a larger staff than in 1914. The reports state, however, that in many towns demobilization and the departure of the American troops were causing a marked decline in custom. Watering-places had an average season, some of their former clientele having returned to them; certain resorts were even busier than in normal times. There were complaints at Bordeaux that commercial travelers were not circulating as actively as before the war. The winter season on the Riviera at the end of 1919, while superficially brilliant, was said by the hotel-keepers to be only moderately profitable.

As regards the *mineral water* industry, the bottling of Vittel water was reported at the end of 1915 to have been resumed and to be gradually increasing, after a suspension of several months. Eighty hands out of the normal 130 were in employment, and output was about half that of previous years. There was a shortage of labor and bottles, but for which output would have been much larger, in spite of the stoppage of exports to Russia and Roumania, and the decline in exports to America and Great Britain.

The reports state in 1916 that the company farming the Vichy springs, which normally employed 396 workmen, had replaced some of these in its bottling, capsuling, and labeling shops by 66 women and 75 children. Sales amounted to only two-thirds of the normal.

In 1917 the mineral water establishments of the Loire had lost half their male staff, while the number of women employed was practically stationary; output was below the normal, and a manufacturer declared that, but for the machinery installed prior to 1914, the business could not have been carried on. Bottles and packing-cases were short; the export of Vichy and Saint Yonne waters, whose output was about three-fifths of the normal, had been hindered by the long winter.

After the war, during 1919, mineral water companies found it easier to recruit male labor and recover gradually their former degree of activity.

The *sorting and sale of rags* were much hampered down to the end of 1915 by the scarcity of vehicles. An important firm at Périgueux, with branches in several towns of the district, from which it received rags for sorting, was obliged to have its workwomen tem-

porarily idle owing to the long delays in the arrival of unsorted rags.

In 1916, the wholesale trade in rags, which in certain districts was sufficiently important to constitute a real industry, would have been working normally but for the difficulty in getting its goods conveyed. Some of the big dealers had purchased vehicles to relieve their premises of the heavy accumulations. A further difficulty arose from the prohibition of the export of rags to neutral countries and from the restrictions on exports to the United States, England, and Italy. Down to the end of 1916, the lack of railway-trucks made it frequently necessary to suspend work, for at times no consignments could be dispatched for months together.

The wholesale trade in woolen and cotton rags failed to find, in 1917, the same market as in peace time. The suspension of the manufacture of novelty fabrics restricted the employment of woolen rags to the hosiery trade, and even that trade made use of them in the production of only a few articles. The fact that allied countries were utilizing shoddy in the manufacture of army cloth entailed a great reduction in export. Cotton and linen rags were in great demand for paper-mills, but were scarce, and lacked easy conditions of transport. A perceptible improvement in the latter respect was recorded at one moment, but it does not appear to have been lasting, for at the end of 1917, the restriction of the weight of consignments to 300 kilos had a serious effect on the wholesale rag trade. The accumulation of goods in the storehouses threatened the industry with an enforced stoppage. The number of female hands employed on sorting had declined to a marked extent in certain works. And yet there were plenty of offers to purchase from certain trades, such as paper-making, hosiery, and cloth manufacture.

Demand continued good in 1918 and although it was not easy to get goods transported, there were no reports of unemployment in the sorting shops. Demand became even keener after the war, both for rags for paper-making, and for woolen rags suitable for teasing. But the dispatch of bales of sorted rags had become extremely difficult. On the other hand, certain qualities that were not used in France could not be disposed of abroad owing to restrictions on their import, and stocks accumulated to such an extent as to stop

the processes of manipulation on which large numbers of women were usually employed.

During 1919 the trade had large export dealings, especially with America; woolen rags were much in demand for teasing; but business in rags for paper-making, although active in one center, was not equally prosperous everywhere.

At the end of 1919 and the beginning of 1920, raw material was abundant, teasing was active, but sorting was very slow, owing to the shortage of female labor. For this reason one dealer had had to give up sorting, another had engaged foreign workwomen, who were unskilled and whose output was small. A recent decree had prohibited the export of scraps of new woolen and cotton materials, thus putting an end to part of the export trade.

Retail Trades. Of all the branches of retail commerce, luxury trades suffered most; and among the big shops the most severely tried were those which catered to foreigners and rich customers. In the others, receipts remained at a far lower figure than in previous years. It was not so much that the number of customers had diminished, particularly in November and December 1914, but that they purchased less expensive goods. In the Bordeaux area bazaars were reported as doing, from September 1914 onward, a much better business than usual, and this flourishing condition was fairly general among French bazaars.

The catering trades were very prosperous during 1915; but other trades showed a decline of business (varying in the Nantes area, for instance, between 30 and 75 per cent), except however in towns where there were regimental depots, for there business remained more normal. The big shops had nearly as many customers as before the war, but these bought cheap goods and little of them. In Paris the receipts of most of the great shops were substantially less than half those of the previous year; but at Dijon the decline was only 40 per cent. Traders at Nantes complained of the difficulty of procuring materials of the kinds in current use—cloth, velvet, drill, linen, and tulle—also sewing-thread and household utensils—ironmongery, basket-work, glass, and crockery. The position at the end of 1915 may be summed up as follows: although trade suffered generally from the difficulties that were hampering industry and transport, conditions had improved in most branches,

except in the luxury trades; and even some of these, at Lyons and Marseilles, were reported to be doing business. The catering trades were the most prosperous, and this prosperity was especially pronounced in certain towns within the army zone, where the presence of French or allied troops provided a first-rate market.

The position of commercial firms remained satisfactory in 1916; most retail trades did excellent business, especially caterers, who, in general, were very flourishing, and dealers in clothes and in footwear, who however complained of the difficulty of procuring fabrics, haberdashery, and boots and shoes. Trade was particularly prosperous in localities where troops were quartered or on their line of march, and in centers where large numbers of workers were employed in munition factories. It was slacker in towns where industry was less active. But even in the small towns, retail trades did not suffer excessively from war conditions. The funds supplied by Government allowances and the work done by women kept trade going, and purchases, contrary to what might have been expected, began to include not only articles of prime necessity, but also luxuries, or at any rate fancy goods (toilet articles, etc.). The wages of shop employees, which had been reduced almost everywhere on the outbreak of hostilities, were now generally back at the normal rates. The luxury trades, however, of the Riviera did little business, for wealthy customers were still lacking; and it should also be mentioned that bakers suffered from the shortage of skilled hands.

The position of retail establishments remained very good at the end of 1916, in spite of the transport crisis, which made it difficult to obtain supplies. Most of these establishments were employing an increasing number of women, and activity was still greatest in localities where troops passed or were quartered. This particularly applied to the catering trade, and the personnel employed in it had increased in consequence. Government however was endeavoring to check the rising cost of living by fixing prices, and by the establishment of departmental butchers' and grocers' shops and of co-operative societies. The consumption of cakes, in particular, was so great as to bring about a scarcity of certain commodities. In the overcrowded centers of industrial population business was good in the clothing, linen, and boot and shoe trades (even as regards high-class shoes); and in perfumery, jewelry, and luxury goods. It was

extremely active in the fuel trade. There had been a promising development of business at the beginning of the winter season in the large shops, but it was interrupted in certain centers by the course of events in the east of Europe; the end of this year was less good than that of 1915.

Commercial establishments were again busy in 1917 in spite of growing difficulties; their situation remained about the same, and may be said generally to have been slightly less favorable than before the war. The scarcity of supplies alone prevented them from entirely satisfying their customers, for the rise of prices did not deter the latter. Money was circulating freely: clerks had in many instances received an addition to their salaries under the form of a 'high cost of living allowance'; many workwomen were receiving high wages and spending freely; and, finally, the presence of the allied armies in France and the arrival of the American troops were not without their share in producing this abundance of business. The population of a number of industrial and military centers had increased, and a very large number of shops had been opened to supply the additional customers. Small artisans had abandoned their trades to undertake the highly profitable business of retailing all sorts of commodities.

The catering trades were still extremely flourishing in 1917, but supplies were not always sufficient to satisfy the demand. In butchers' and pork-butchers' shops, however, sales declined by 15 or 20 per cent as a result of the obligatory closing on two days a week and Sunday afternoons, a regulation which was generally observed. But this closing did not lead to any discharge of staff, because business was more active on the remaining days. There was a further great rise in the cost of living in districts near the front, for the presence of troops had caused a decline in agricultural production and increased the demand, while the breakdown of railway transport prevented the normal inflow of goods.

Municipal and departmental butchers' shops proved successful in a considerable number of towns, and checked the rise in prices. In the Aveyron coal-field 21 co-operative societies (six of them recently founded) leagued together and extended their sphere of action. The number of their members rose from 2,500 in 1914 to 6,000 at the end of 1917. There was a similar development among

the glass-makers and miners at Albi, and in the Carmaux district. Nor was the movement limited to the working population: mixed co-operative societies, combining every class of consumer, had been formed at Aurillac, Albi, Rodez, and Castres; and a co-operative butcher's and grocer's shop at Elboeuf, initiated by the employers, was well supported by the working and middle classes.

The fabric and clothing trades did well in 1917, especially in the south, where they profited by the prosperity prevailing in the wine-growing and agricultural industries, a prosperity which, however, still fell somewhat short of that known in peace-time. It was noticed, also, that the character of the clientele as a whole had changed; it was not drawn in the same proportions as formerly from the various social classes, this being due to the profound changes that had come about in the distribution of wealth. This change of clientele was observed also in the jewelry trade. The personnel employed in the clothing trade at the end of the year was about equal to that employed in peace-time. The volume of sales in the large shops had gradually increased, and now largely exceeded, in Paris, half the pre-war figure; but certain houses that made a practice of selling on credit had been paralyzed by the mobilization and had not recovered. Linen-drapers were selling at high prices; and although the price of ordinary boots had been lowered since 'national boots' were put on the market, there was a large sale for high-class boots and shoes at very high rates. Luxury articles were in great request, and the supply could not cope with the demand.

In 1918 the situation of the various trades was more irregular. There were impediments and restrictions in respect of both imports and exports. Certain manufactures and trades were subject to control within the country; transport also was a matter of increasing difficulty, what with the classification of goods for purposes of priority according to national requirements, permits for receiving and dispatching, and the irregularity in arrivals and deliveries. The railway companies, in order to facilitate the handling of consignments by their female staff, had decided to accept certain goods only by parcel post, which entailed more writing and an increased use of packing materials, and these were scarce and dear. Nevertheless most retail trades did a good amount of business. The public was spending all the more freely that current wages and the very

remunerative prices of wine and other agricultural produce provided it with ampler resources. If some shops had been closed, others had been started to meet the needs of the moment—for the sale of war souvenirs, postcards, soldiers' requisites, etc.

The catering trades made good profits in 1918, in spite of the constant rise in prices and the ever growing number of control regulations. The suppression of pastry had given rise to an extraordinary development of the trade in fruit and early vegetables. The prohibition of the import of farinaceous pastes from Spain had caused their total disappearance in one area; the scarcity of trawlers kept the price of fish very high. Co-operative societies were started, during the first half of 1918, in a district where they had previously been lacking; some thirty are mentioned in the Vaucluse, five of them at Avignon, and these had combined in a federation comprising more than 30,000 members.

Activity in the trades concerned with toilet articles did not diminish in 1918, and was equal to that of pre-war days. Business was excellent in the boot and shoe trade, and supply could not cope with demand; 'national boots' were much appreciated and in great request, and so were expensive boots at 100 or 120 francs. Linen-draperies in certain towns did very well in spite of the rise in prices, but some fabrics were becoming unprocurable. The course of events in the spring checked the development of business in the great shops; most of them however retained almost all their staff, apart from such hands as left of their own accord; they were doing a great deal of business with the provinces, and dispatching large quantities of goods; traveling requisites were selling well. But the furniture trade was almost at a standstill.

Immediately after the Armistice a perceptible slackening was experienced generally in commercial businesses—retail trade, catering, clothing, perfumery, luxury articles—which had previously been very busy; dealers attributed this to the following causes: the discharge of workwomen from the munition factories, the uncertainty as to future conditions, and the prospect of the stoppage of allowances; while the expectation of a fall in prices kept back the customer. Pre-war prices had increased from three- to fivefold. In certain northern districts which had been devastated by the enemy and where there were now a large number of allied and foreign

residents, the necessities of life, or the objects of a momentary caprice, were being purchased at any price; as supply and production were unequal to so great an increase of consumption, the economic equilibrium was upset and many traders took undue advantage of these conditions. The same commodity was sold at very different prices in neighboring localities; and the official fixed prices were everywhere disregarded.

After this general decline, which was very pronounced on the morrow of the Armistice, the various trades showed a vigorous recovery in 1919. Wages and the return from agriculture were so high that shops sold as much as before the war; and as the receipts in respect of a given quantity of goods were three to five times as great as in 1914, dealers made extremely large profits. Middlemen bought goods that were held up at the factories, transported them by various means, and disposed of them to retailers at an exaggerated price. The price of the same article varied from shop to shop, and the customer had difficulty in protecting his interests. In the liberated area in the north, retail trade was very active, but wholesale and semi-wholesale trade had not yet been re-established. The limit of 300 kilos on rail consignments hampered purchases of large quantities and made it impossible to buy at favourable rates.

Business continued profitable in the catering trade, for supply had become easier. Many small houses that had been closed since 1914 started work again, the proprietor having been demobilized. The clothing trade flourished in 1919, as a result of purchases by men returning from the army and of the demand for the liberated region. The great Paris shops were employing as large a staff as in 1914. Transport conditions improved, deliveries could once more be effected within the normal time, and business with the African and West Indian colonies revived.

All retail trades remained intensely busy at the end of 1919 and the beginning of 1920. Instead of falling, as had been expected after the Armistice, prices rose sharply in all directions; but nevertheless the public, and especially the working and rural classes, bought largely. There was a slackening of business in certain towns where the middle classes predominated, and the departure of the American troops also made itself felt. The catering trade was still prosperous; a catering firm with numerous branches increased its personnel from

112 in July 1919 to 205 in January 1920. Clothes, boots, and all articles in current use were disposed of at very remunerative prices. Luxury trades also continued to flourish. The shops in the liberated area, which had been pillaged or destroyed, had been provisionally restored, and were living from hand to mouth, without being able to reconstitute their stocks; and their staff was reduced to a minimum.

We may add, finally, that the *flower* trade had suffered severely during the war, as regards both the home market and export; in 1917, export business was one-tenth of the normal. The ironmongery trade was also much affected throughout the war by the scarcity of household utensils, as metals were supplied sparingly to manufacturers for other than military purposes; and the quantities available for the public were below requirements.

APPENDIX I

INDUSTRIAL CONDITIONS IN THE SEVERAL DISTRICTS

WE have seen that the various parts of France fared very differently, in point of industrial prosperity, during the war; we shall here deal with each district at somewhat greater length, beginning with the districts of Lille and Nancy. These include almost the whole of the area that suffered from invasion and from military operations, and comprise, as has already been said, the chief coal- and iron-mining region, and the principal center of the heavy metallurgical industry. The information we shall give will be mainly drawn from the reports of Labor Inspectors and the complaints submitted by employers to the local Economic Commissions and Consultative Councils.

(i) *Calais.*

The Calais district (called the Lille district in the Labor Inspectors' reports) comprises the two departments of the Nord and the Pas-de-Calais. In these the disturbance caused by the mobilization was accentuated by the concentration and passage of the armies, both allied and enemy, and by the destruction caused by the fighting. The proximity of the enemy and difficulties of transport and supply made it extremely hard to organize production on any stable basis. Nevertheless, as the index-numbers of employment show, the goodwill of employers and workers was daunted neither by these impediments nor by the danger from bombardments and from enemy attacks. It was essential to keep certain centers of production going, even when they were under the fire of the German guns. These were not only coal-mines: certain factories, at Dunkirk for instance, gave up work only at the end of 1915, when demolished by shell fire. It was naturally the industries working for national defense that did well, and these, thanks to Government assistance, were by the end of 1915 giving excellent results; while the others, left to their own resources, were overwhelmed with difficulties.

The situation in 1916 was similar, but its chief characteristics

were more pronounced: work was plentiful in factories engaged on orders for the military administration, because they were supplied with the labor and other resources that they needed; production to meet civil needs and for export fell short of requirements. Complaints at this time relate to the lack of skilled male labor, and of raw material and coal, and to scarcity of tools, spare parts, etc.

At the end of 1917 it was found that many employers, under pressure of circumstances, were changing the character of their works, so as to adapt them to the needs of the moment. The necessary reorganization was rendered especially difficult by the deficiency and inferior quality of the available labor, and by the scarcity of coal. It was for this reason that several windmills were set working again in the Calais district in 1917, and water-wheels that had long been abandoned were brought into use by flour-mills, paper works, and tanneries. Nevertheless the statistics show at the end of 1917 a marked slackening of activity, for the bombardments were beginning to drive workers, male and female, from the towns.

In the first half of 1918 the German advance caused the evacuation of some highly important industrial centers (Bailleul, Béthune, Hazebrouck, etc.); transport for industrial purposes was suspended, and a considerable part of the population fell back to the south. This led to the closing of some large factories and to a reduction of work in others. (The index-numbers are based on the factories that the Inspectors were able to visit, and do not take into account those which were evacuated.)

After the Armistice, the greater part of this district remained for a time in a state of industrial lethargy. This was due to the lack of transport facilities, to uncertainty as to the economic provisions of the treaty of peace, to speculation for the rise, and so forth. Moreover, in the area that had for four years been in enemy occupation, the following conditions must be borne in mind: all means of production had been removed either by deliberate destruction or by systematic requisitions; and railway and road bridges and canal locks had been demolished. The difficulties in the way of resumption of work were here stupendous.

Nevertheless after the first few months of 1919, though Lille showed only a slight recovery, 115 factories were at work in the less

severely devastated region of Roubaix-Tourcoing, and 15,000 workers were in employment as against 42,000 before the war.

(ii) *Nancy.*

The district of Nancy comprises six departments, Aisne, Ardennes, Marne, Meuse, Meurthe-et-Moselle, and Vosges: the army front was stabilized in five of these; the sixth, the Ardennes, a highly industrial area, was completely occupied by the enemy. In this district therefore, as in the preceding one, industry was carried on with special difficulty, for the neighborhood of the fighting aggravated the uneasiness that prevailed in all parts of the country.

In January 1915, more than one-half of the industrial establishments situated in the uninvaded portion were still closed down. There was in consequence a large amount of unemployment, notably in the industries occupying women and children, such as dress-making, sewing, and embroidery. But many employers, in the early months of 1915, offered work to these women, and to boys and girls under 18, though it was work of a kind that had hitherto been done only by men. An increasing number of establishments reopened; orders flowed in, and the complaints recorded relate in particular to the constant rise in the price of coal and raw material, and to the difficulty of communications by rail and post. These and the control of lighting, together with the military occupation of factories and the danger of bombardment, were the principal impediments in the way of industry until the middle of 1917. Nevertheless the economic conditions were so good in factories working for national defense (metal works, foundries, engineering shops, boiler works, and certain cotton-spinning mills) that they were employing more than their normal staff and introducing night shifts.

The production of, and trade in, food-stuffs were in like case, owing to the extraordinary consumption in the towns and villages where French troops were quartered; both the big food businesses and the small dealers enjoyed a period of unparalleled prosperity.

But in a good number of industries the hours of work were very short, output being barely one-half of the normal, owing either to scarcity of personnel, particularly of specialist workmen; or to dearth of raw material and especially coal; or to irregularity of

transport. The industries connected with building (brick works, etc.), with furniture, and those supplying articles of luxury and fashion were completely paralyzed. A few industries (fine hosiery, optical glass, etc.) worked especially for export to England and Italy.

In 1917, whereas the restrictions on the consumption of sugar, bread, and illuminating gas and the meatless and pastryless days caused only minor discomfort, there were many complaints that the scarcity of coal, of labor, and of means of transport prevented an increase of output. The war factories alone, privileged in these respects, were working at high pressure, enlarging their premises or plant, and distributing dividends; a few other employers, taught by experience, had been able to accumulate a stock of coal, to install electric power, or to heat their furnaces with wood, sawdust, or turf. Motors and other mechanical processes were also developed for loading, unloading, and moving goods, to meet the scarcity of labor.

If the economic situation in the Nancy district in 1917 may be considered good, having regard to its proximity to the front, it became extremely bad in the first six months of 1918. The German offensive brought about the closure of the factories in the Aisne and of most of those in the Marne that had hitherto remained open. Moreover the lack of means of transport and the interruption of the great Paris-Strasburg line immobilized coal and raw material in Paris or in the ports. Short time had accordingly to be introduced in many establishments, other than wood-working factories and those utilizing waste for fuel or employing water-power. Workmen received only half wages and were occupied on such tasks as cleaning machinery, or on agricultural work.

These unfortunate conditions were even aggravated at the end of the war, when the manufacture of munitions was suspended, notwithstanding that the first coal-barges from the Saar arrived very quickly. No improvement occurred until the law of the 23rd April 1919 on the eight-hour day came into force; then, after discussions and agreements between employers and workmen, certain important works were reopened, and likewise some factories that had remained closed during the war.

None the less the year 1919 was a period of prolonged industrial

crisis. Workmen were continually complaining of the high cost of living, which neutralized the increases of wages conceded to them; for the higher wages were raised, the more rose the cost of living. This occasioned unrest and strikes. Employers complained no less keenly of the lack of means of transport, of coal, and of skilled labor; they complained of the enforcement of the eight-hour day at a moment when what was required was accelerated output; and they complained of the impossibility of getting machine-tools. Apart from a few industries (hosiery, linen goods, musical instruments), exports were at this time insignificant in amount.

The conditions prevailing in the portions of this district, as of the Calais district, evacuated by the enemy were specially aggravated during the last months of 1918 by the devastation carried out in these areas. Here, as there, many factories had been destroyed, and the plant broken up or carried off. Employers, who were impatiently awaiting contractors and material for the work of reconstruction, grumbled at the slowness with which Government granted advances of compensation, and at the delays in the arrival of machine-tools and raw materials. Finally, there was a serious crisis in labor supply, owing to the lack of housing for the workers; these moreover deserted private employment in order to accept better paid work on the restoration of the liberated regions.

(iii) *Paris.*

Paris, comprising the three departments of Seine, Seine-et-Oise, and Seine-et-Marne, is one of the districts where population is densest and industry most concentrated. The upheaval caused by mobilization was naturally felt there very acutely; but its consequences have already been set forth, and we will only remind the reader that the number of unemployed in the Paris district reached nearly 500,000 in August 1914.

The second returns of the Labor Inspectors, for April 1915, showed a marked recovery; only the building and luxury industries remained stagnant. The Inspectors have here made use of the statistics of industrial accidents as a measure of industrial activity, for these relate to all industrial and commercial establishments. The number of accidents reported in the Paris district had been steadily increasing before the war: in 1910, 109,516; in 1911, 130,192 (an

increase of 20,676) ; in 1912, 145,321 (an increase of 15,129) ; in 1913, 155,664 (an increase of 10,323). Although the rate of yearly increase was diminishing yearly by some 5,000, the normal increase had certainly not come to an end in July 1914 ; the number of accidents between August 1914 and April 1915 would not normally have been less than the number between August 1913 and April 1914. Yet as compared with 27,106 accidents reported in August and September 1913, there were only 4,961 in August and September 1914, or 18 per cent ; against 41,140 in October, November, and December 1913, 11,701 in the corresponding months of 1914, or 28 per cent ; against 36,202 in the first quarter of 1914, 16,107 in the first quarter of 1915, or 44 per cent. Even allowing for the fact that a casual and inexperienced staff had been recruited, we may see in these three percentages, 18 per cent, 28 per cent, and 44 per cent, a fair indication of the economic recovery in the Paris district during the first eight months of the war. We may recollect that the proportion of personnel employed in the establishments inspected at those dates was 29 per cent, 33 per cent, and 49 per cent ; and the difference between 18 per cent and 29 per cent may be attributed in great part to the slackness of work in such establishments as remained open in August 1914.

The recovery became more pronounced in the second quarter of 1915—it is significant that most of the power-stations supplying motive force to the smaller works were now started again—and persisted in face of numberless difficulties until the end of the year, when 67 per cent of industrial undertakings were at work and employing 77 per cent of their normal personnel. During the first half of 1916 the proportion of undertakings at work rose to three-quarters and of personnel to nine-tenths of the normal ; before the end of the year, the latter exceeded the normal. If many small works had to remain closed, for lack of a manager or of raw material suited to the new productions, factories working for national defense had doubled or trebled in size, and employers, after exhausting the supply of female labor, were having recourse to foreign and colonial workmen.

These conditions did not however indicate an exceptional degree of national prosperity, although some slight improvement in industries not concerned with war requirements may be observed early

in 1916. Orders could not be executed for lack of means. From the standpoint of export, not a single industry was exceeding, at the beginning of 1916, the amount of foreign business it had done prior to 1914; only a few were doing as much. And yet many articles of French production might have been supplanting similar German goods; fresh customers were coming to France, and old clients were increasing their orders. Allied or neutral countries became excellent customers, notably North and South America. The latter were asking for furniture, tiles, ironwork, etc.; England, Russia, Italy, and Spain for artificial flowers, perfumery, and toys. Unfortunately the internal difficulties already set out were aggravated by the insecurity of the sea routes and the unnecessary formalities that attend the export of goods from France.

By the middle of 1917 the industries of the Paris district working for private customers had reached a normal condition. Apart from war industries, only textiles and the manufacture of military articles, jerseys, and gloves showed a real increase. Meanwhile the dearth of coal was making itself felt and the electrification of works became increasingly frequent. But the power-stations could not supply everybody; attempts were made to supply customers in rotation, and work in the suburbs had to be suspended on certain days of the week.

Industrial activity was maintained until the first half of 1918, when it showed a pronounced reduction, due in the first place to the aggravation of the general difficulties (notably lack of transport), and particularly to the menacing aspect of the military situation, and the frequent bombardments of the district. Nevertheless factories in general continued to run, notwithstanding the removal of certain munition works and the congestion of railway transport that resulted.

The signing of the Armistice did not lead to an immediate and marked recovery. The sudden suspension of munition work took the employers by surprise. The adaptation to peace conditions proved a slow and difficult matter: not only plant and processes, but commercial habits, after four years of officialdom, required modification. The uncertainty of prices and the exhaustion of coal supplies were a further source of difficulty. At the beginning of 1919 a long period of suspense set in, during which employers felt hampered

by the introduction of the eight-hour day and by the moral condition of the workers, whose productive powers seemed impaired by indifference and fatigue. But toward the end of 1919 the symptoms were better: prices of raw materials were stabilized; successive demobilizations were releasing labor; trade conflicts were being settled; and orders were plentiful. The year 1920 was prosperous at first; the great crisis came in its last months.

(iv) *Limoges.*

The district of Limoges comprises eight departments of the center of France. After a short period during which unemployment prevailed, it suffered during the war chiefly from a prolonged scarcity of labor. From the beginning of 1915 recourse was had to female labor, works that had been closed were reopened, and wages had to be increased, in metallurgical works by 15 to 20 per cent, in plate glass factories by 20 to 25 per cent. Women were replacing men in every kind of employment, in offices, engineering shops, munition factories, hotels, and tramways. There were only a few isolated instances of slack trade, in the tapestry works of Aubusson, in the linen factories of the Indre, and in building. We need not refer to the difficulties in respect of coal and transport that prevailed everywhere.

In 1916, notwithstanding plentiful orders, only the war industries were yielding a full output. Nevertheless the Labor Inspector gives a satisfactory account of the industrial situation at the end of the year. Whereas in August 1914 only 1,127 factories were at work out of 1,985 inspected, by the end of 1916 many had resumed operations, had adopted new methods, or had even started new industries to supplant enemy products.

Unfortunately the situation changed for the worse in the first half of 1917; supplies of raw material became inadequate owing to the submarine war, and the dearth of coal was severely felt; so that it proved impossible to execute all the orders of French and foreign customers. An attempt to make good the deficiency of coal by working the peat found in the valley of the Essonne at Pithiviers was unsuccessful, the prisoners of war applied for in this connection being sent too late and in insufficient numbers. Moreover, owing to lack of organization, the electrical power that the river Vienne

might have supplied remained in large measure unutilized. Works designed for the purpose of employing this water-power and that of the Creuse took a long time to construct, and the majority of them were not completed before the end of the war. Some manufacturers improved their heating processes: porcelain works burnt wood, and tanneries the tan from their pits; other factories consumed heavy oils, or coal and coke dust.

After the Armistice, the situation remained for a time unsatisfactory, labor being scarce and dear. The unfavorable conditions persisted into 1919, the trade placing orders with timidity, and workers showing a lack of zeal. But various causes brought about a marked improvement toward the end of the year: stocks that had become exhausted during the war had to be renewed; plant and methods of work had been brought up to date; and labor was costing less, women taking men's places in work that they had never previously done.

In short, the industrial position was very similar to that prevailing before the war; if some industries had fallen into difficulties, the activity of others had increased. Certain industries even, that were formerly located in the devastated regions or in the suburbs of Paris, had now definitely established themselves in the center of France.

(v) *Dijon.*

In the ten departments constituting the Dijon district, scarcity of labor, and particularly of skilled labor, was the impediment most severely felt by industry. The economic situation, which became tolerably good in the early months of 1915, made no further progress for lack of workers. There was no unemployment except of such as would not work, and many orders had to be refused.

The Dalbiez law (see page 27), which allowed the temporary exemption of the older specialist workmen, was of great assistance to the district, and enabled numerous factories to resume work. There ensued a marked increase of industrial activity toward the end of 1916, but the increase was mainly confined to munition factories. Notwithstanding the elimination of German competition, the position was not favorable for the export trade. Factories working for private customers suffered most acutely during 1917 and the

first months of 1918, particularly from difficulties of transport and scarcity of coal. The same devices were adopted as in the district of Limoges to remedy the latter deficiency. The Creusot works set up a special section to study methods of industrial heating; it experimented with different types of furnace and gave useful advice to manufacturers. Much recourse was had to electric power.

The same period of suspense and hesitation as has been noted in other districts followed the Armistice, and there was a similar recovery at the end of 1919. But output, notwithstanding all efforts to increase it, fell far short of that obtained before the war, firstly because labor was still scarce and inefficient (although its efficiency was reported by manufacturers to be steadily improving); secondly because the scarcity of coal continued; and thirdly because means of transport were still defective.

(vi) *Rouen.*

In the eight departments grouped round Rouen all the great factories employed in connection with national defense or supplying the military administration were, by the end of 1914, working at full power, eleven or twelve hours a day, some of them day and night, and the situation throughout the early period of the war remained favorable. Unemployment was non-existent and women and children were replacing the men called up, while a few temporary exemptions allowed the indispensable operatives and managers to remain at work. The position even improved gradually until the early months of 1916, notably at Rouen, the coal port of Paris. Near Havre, Caen, and Rouen, munition factories and metal works were started or enlarged. But the scarcity of labor made itself felt in the second quarter of 1916, and applications were made for the services of disabled men, for foreign and even for Chinese labor. The rise of wages, the high cost of freight, and consequently of coal, were further causes of trouble: certain textile and other factories had, at the end of 1916, temporarily to stop work for lack of fuel, while others reduced their hours. But in 1917 manufacturers organized themselves to meet this deficiency, by adopting the expedients already referred to in connection with other districts. In short, industry in this region, with ports at hand to meet most of its

requirements, had no great difficulty in adapting itself to the circumstances of the war.

Here, as in other districts, the Armistice was followed by a period of economic uneasiness and for the same reasons: defective means of transport; uncertainty as to the conditions of the treaty of peace; introduction of the eight-hour day; strikes in the metallurgical, textile, building, and chemical industries; increase in cost of living, of labor, of coal and raw material; and difficulty of obtaining machinery. Thus the tendency to start and enlarge factories in this district, which had manifested itself during the war, was arrested.

As elsewhere in France the situation improved in 1920, to be followed by the crisis of 1921.

(vii) *Nantes.*

In the ten departments of north-western France composing this district we find, during 1915, industry hampered by the same impediments that we have already noticed in other regions. On the whole, considering the circumstances, the position remained rather favorable until the middle of 1917, when the scarcity of coal drove manufacturers to use as fuel anything capable of combustion. The district, as a whole, is not a highly industrial one, and its activity was comparatively slight during the war.

(viii) *Bordeaux.*

The district of Bordeaux comprises eleven departments in the south-west of France. Here a short period of unemployment was followed by an acute scarcity of labor. All branches of industry suffered from it, other than those employed on national defense, which were assisted by the temporary exemption of specialists, by the labor of prisoners of war and foreign workmen, and by female labor in great quantities, especially in the powder-works of Saint Médard. The low efficiency of labor and the high cost of raw material prevented French products from supplanting those of the enemy on foreign markets.

In spite of all, a tendency to recovery was observable in all industries at the end of 1915, notably in textiles and the manufacture of food-stuffs; the transport conditions were improving perceptibly, and notwithstanding the premature calling up of the class of 1917,

manufacturers were able to execute a very large number of orders. Industrial activity was maintained and increased in 1916, except in printing and binding, furniture-making, and building. A large labor supply was being obtained from Spain, Morocco, and Algeria; but exports remained insignificant and output could not cope with orders.

The year 1917 was marked on the one hand by an improvement in transport facilities, on the other by a greater scarcity of coal. The usual expedients were resorted to; but wood fuel did not suit glass-works and brick-kilns, which had to close down; it is moreover very costly and requires much labor to handle it. As a result the general position, notwithstanding the great prosperity of the munition factories, became worse, and at the end of 1917 there was actually a beginning of unemployment in female labor.

The difficulties became greater in 1918; the unemployment of women coincided with an exorbitant rise, partly due to speculation, in the cost of food. Male workers became excessively scarce, and successive increases of wages had to be conceded to them. The situation became even more acute in the last quarter of the year, after the Armistice, for the reasons noticed in connection with other districts.

There was a marked recovery at the end of 1919, but conditions, instead of developing in 1920, remained stationary, industry being hampered by the dearth of raw material and coal, and by the tardy reorganization of the means of transport. Skilled labor was scarce in the iron and wood industries, but sufficient in the others; this gave rise to temporary unemployment among demobilized men, and to protests on their part against the employment of women.

By the end of 1920 the situation was becoming serious; works were congested and were slowing down, output was diminishing, capital was immobilized, while commerce was making enormous profits. But taken as a whole the period of the war had been one of prosperity for this district.

(ix) *Toulouse.*

The district of Toulouse, composed of ten departments, occupies the south center of France and profited by its favored geographical position. After a drop in August, the curve of production

showed, by the month of October, a marked upward movement. Except during the first days after mobilization, there was no unemployment: the Chamber of Commerce of Mazamet voted a sum of 10,000 francs in August 1914 for the relief of the unemployed, but there was not a single application. The personnel of such works as were closed down took employment in other industries, notably in those connected with the war, and work was found for all refugees that were sent into the district.

The position of the workers remained favorable in 1915; an employment agency founded at Albi received no applications for places. The situation of the various industries improved likewise. No doubt it was the war industries that displayed the most feverish activity, and the powder factory of Toulouse underwent a prodigious development; but the other industries (except building and luxury trades) followed a similar course, notwithstanding the scarcity of labor.

In the first half of 1916 all the industries of the district (except printing) were in full swing, and orders were exceeding the capacity of output, which was hampered by the same obstacles that we have found in other parts of France, and notably by the failure of transport facilities. Complaints in regard to this were universal from the end of 1916 to the middle of 1917, when conditions were much improved.

The transport question was of such importance that the better facilities obtained in 1917 sufficed to maintain industry, on the whole, in a satisfactory condition in spite of other serious difficulties that arose at this moment, in particular the calling up of the class of 1918, followed by a severe 'combing out' of civilians. However, this had been foreseen, and a fresh staff of women and children had been trained by employers; moreover the military authorities granted temporary exemptions to the older managers, to foremen, and to specialist workmen. The dearth of coal was met by the devices employed in other districts.

Notwithstanding the energy and resourcefulness of the manufacturers, the situation became worse in the first half of 1918, owing to the gaps caused by the fresh calls to the colors, which neither the labor of women nor that of foreign workmen could make good.

There was a regular exodus of Spanish workmen from the factories to the farms, because of the high wages offered there.

The Armistice here as elsewhere brought an aggravation of the general conditions. There was an obvious recovery in 1919, although the introduction of the eight-hour day produced at first a position of some uncertainty. But manufacturers understood the necessity of adapting themselves to the new conditions and effected the necessary reorganization of their factories; the workmen, on their side, showed goodwill in agreeing to a certain amount of overtime.

(x) *Marseilles.*

The ten departments of the district of Marseilles had the advantage of being situated far from the theater of war, and their economic situation became favorable as early as January 1915. A short period of inactivity was followed by a vigorous recovery, due to plentiful orders, to the grant of credits by the banks, and to the enterprise of employers, who contrived to replace by such labor as was available those of their staff who had been mobilized. By July 1915 there was no unemployment among men, and as for the women, if employment was scarce for the dressmakers of Nice and other towns, all the hands from the cotton- and silk-mills could find work on the farms; it was only in two departments that, at the approach of winter, some women were without employment.

This situation went on improving throughout 1915, especially in the war industries, and that notwithstanding the causes of embarrassment that prevailed everywhere.

Industries were extremely active in 1916, in spite of a perceptible slackening in oil and soap factories, in silk-mills and cork factories, and in the luxury trades of the Riviera. The disappearance of competing German and Austrian products was a favorable factor. The energy and adaptability of the women also contributed powerfully to the development of certain manufactures, notably of chemicals, for which new factories with improved plant were constructed, with a view to excluding future German competition.

But difficulties increased during 1917, and were especially felt by the ordinary industries. The chief of these difficulties were the deficiency of transport, affecting the supply of coal and raw materials; and the insufficiency of hydro-electric power owing to the

abnormally low level of water in the basins of the Durance and the Var.

The former trouble was aggravated early in 1918 in the south-eastern part of the district by the fact that the railway lines were almost exclusively employed on the maintenance of communications with Italy, which just then was menaced by the Austrian attack. Some factories stopped work and others slowed down, and stocks in hand became enormous. Many industries—food, printing, textiles, clothing, and transport—showed less favorable results than those of the preceding year. But a few made still further progress: paper, leather, and skins, precious metals, and building. As industrial prosperity in this region is bound up with the use of hydro-electric power, various schemes were examined for utilizing waterfalls in the Alps, the Cévennes, and particularly on the Isère.

The position after the Armistice was unfavorable, and did not improve perceptibly in 1919. The total personnel employed in January 1919 fell below that of July 1918. Besides the reasons that have been noted elsewhere, reference is made in this district to the insufficiency of cheap electric power, the power companies having profited by their monopoly to raise the tariffs. Recovery did not take place until 1920.

(xi) *Lyons.*

The district around Lyons suffered from all the hindrances to industry that we have seen the war produce in other districts, but particularly, at the outset, from a lack of orders, due in part to the loss of the German market. Certain paper works and metal button factories found compensation in orders from England and America; cotton-mills were able to execute orders that the manufacturers of the north had had to refuse; and some orders were placed by the Government.

By the end of 1915 the situation was satisfactory: factories working for the export trade (silk, ribbons, gloves, paper, etc.) could not meet all the demands made upon them, for lack of specialist staff and of dye-stuffs. The war industries were working at high pressure, supplementing their staff with Algerian and Spanish labor, and with women. Those supplying ordinary requirements, though less well off, followed the general tendency, thanks to indi-

vidual enterprise and to the employment of women and of foreign labour.

At the end of 1916, although lack of transport and raw material was beginning to cause embarrassment, the chemical and metallurgical industries were far more active than in peace-time; food, textiles, paper, and leather were in their normal condition; building and wood-working, though somewhat less prosperous, were improving. These favorable conditions prevailed all through 1917, mainly because, as this district is the home of water-power, the dearth of coal was not severely felt there. Nevertheless the industrial demand for power was so great as at times to exceed the supply, so that it became necessary to cut off the current for some hours daily from factories not employed on war work.

Economic conditions, in spite of events, remained very satisfactory in the early part of 1918; it might have been expected that the bombardment of Paris, the prime market for Lyons silks, would have an unfavorable reaction on this district. But after a slight weakening, business by the end of April had resumed its normal course. Only the Armistice brought a sudden and general check, for the same reasons as previously noticed. Although fresh orders were restricted, there remained a sufficient number to prevent any acute unemployment; demobilized men found work, and women returned to their pre-war avocations. The position improved a little during 1919, after which the flow of orders rapidly exceeded the capacity of output, and the supply of labor fell short of requirements.

APPENDIX II

LOSS OF WORKERS THROUGH INVASION

<i>Industries or groups of industries</i>	<i>Number of workers (1906 census)</i>			<i>Percentage of active population of the ten invaded departments to active population of whole of France</i>
	<i>In whole of France</i>	<i>In invaded region</i>	<i>Percentage of loss</i>	
Fisheries	78,000	266	..	14.2
Forestry	62,423	9,572	15.3	24.6
Agriculture and stock-breeding	8,714,630	447,512	5.1	9.8
Mines	205,898	86,063	41.8	57.5
Quarries	75,129	8,348	11.1	20.6*
Ill-defined industries	11,283	866	7.6	11
Food industries:				
Flour, butter, cheese	101,693	5,656	5.5	
Alcohol, sugar	25,503	10,764	42.2	
Spirituos liquors	23,850	3,998	16.7	
Beer, cider, aerated waters	32,770	13,610	41.5	
Baking and pastry-making	206,853	19,382	9.3	
Various food-stuffs, confection- ery	27,869	4,011	14.4	
Preserved meat and fish	52,602	5,328	10.1	
Butchery, tripery	4,449	606	13.5	
Starch, margarine	3,472	1,265	36.4	
Total food industries	479,061	64,620	13.4	20.4
Total chemical industries	124,644	16,029	12.8	17.6
Total rubber and paper industries	84,655	4,884	5.7	15
Total printing and binding industries	107,481	9,983	9.4	13
Textile industries:				
Flax, hemp, and jute	47,513	23,235	48.8	
Linen and hempen cloth	66,771	35,418	53	
Cotton	167,202	34,712	20.7	
Wool	171,349	110,220	64.3	
Silk	123,597	3,759	3	
Dyeing, dressing, and printing	49,790	15,788	31.7	
Hosiery	56,682	7,774	13.7	
Lace and embroidery	156,554	25,903	16.5	
Trimmings, ribbons	48,371	3,807	7.8	
Ill-defined textile industries	26,160	8,985	34.3	
Total textile industries	913,989	269,601	29.4	43.2

* This figure relates to all classes of mines. On the eve of the outbreak of war, 205,000 miners were employed in the French coal-mines, 90,000 of whom worked in mines that were occupied by the enemy in 1914, that is to say 44 per cent of the total; 25,500 miners were employed in iron-mines in 1913, of whom 15,500 or 61 per cent worked in mines that were seized by the enemy.

APPENDIX II (Continued)

<i>Industries or groups of industries</i>	<i>Number of workers (1906 census)</i>			<i>Percentage of active population of the ten invaded departments to active population of whole of France</i>
	<i>In whole of France</i>	<i>In invaded region</i>	<i>Percentage of loss</i>	
Total manufacture of textile goods and clothing	1,551,131	125,215	8	14.4
Total industries utilizing straw, feathers, and hair	42,568	9,057	21.2	28.8
Total leather and skin industries	334,203	28,831	8.6	16
Total wood-working industries	704,695	56,477	8	15.9
Metallurgical industries:				
Production of iron and steel	56,490	34,246	60.6	
Production of divers metals	13,339	2,618	19.6	
Total metallurgical industries	69,829	36,864	52.7	62.1
Ordinary metal-working industries:				
Forging, edge-tools, etc.	179,238	32,049	17.8	
Nail-making, iron and steel im-				
plements	26,398	3,209	12	
Bridge and girder work	66,038	6,514	9.8	
Sheet-iron	11,697	3,354	28.6	
Gun-making	7,875	134	1.7	
Boiler-making	282,656	49,467	17.5	
Electrical apparatus	19,648	1,577	8	
Copper and bronze articles	60,796	4,505	7.4	
Surgical instruments	1,787	34	1.9	
Optical instruments	9,210	652	7	
Musical instruments (of metal)	2,480	....	..
Tin articles	42,515	3,220	7.5	
Engraving on metal	4,730	92	1.9	
Clock-making, etc.	39,436	1,907	4.8	
Electro-plating	3,873	144	3.7	
Total ordinary metal-working industries	758,377	106,858	14	20
Total precious metals work	28,342	310	1	4.1
Total precious stones work	5,385	.....	..
Total stone-cutting and molding	46,612	5,659	12.1	16.1
Total earthwork and stone building industries	550,130	56,216	10.2	16.1
Lime, bricks, pottery, and glass-making industries:				
Lime, plaster, and cement	29,704	1,855	6.2	
Brick-making, etc.	55,889	6,645	11.8	
Earthenware and porcelain	28,262	3,786	13.3	
Glass and enamel	48,560	17,508	36	
Mirror and glass decoration	4,416	280	6.3	
Total of lime, bricks, pottery, and glass-making industries	166,831	30,074	18	28.3

APPENDIX II (Continued)

<i>Industries or groups of industries</i>	<i>Number of workers (1906 census)</i>			<i>Percentage of active population of the ten invaded departments to active population of whole of France</i>
	<i>In whole of France</i>	<i>In invaded region</i>	<i>Percentage of loss</i>	
Total handling of goods	395,012	35,427	8.9	14.5
Total of transport industries	492,325	54,287	11	17.4
Various branches of commerce	1,864,210	170,794	9.1	14.5
Amusements, agencies, etc.	63,431	5,151	8.1	15.2
Banks, insurance, etc.	75,040	5,483	7.3	11.4
Liberal professions	483,179	34,516	7.1	
Personal attendance and domestic service	1,012,232	73,786	7.3	
State services (general)	1,142,861	50,013	4.3	
State services (industrial)	77,293	2,886	3.8	5.9
Total active population	20,720,879	1,805,759	8.7	14.4
Population employed in manufacturing industries	5,979,216	821,555	13.7	21.1

APPENDIX III

LOSS OF INDUSTRIAL ESTABLISHMENTS THROUGH
INVASION

<i>Industrial group</i> <i>1</i>	<i>Number of establishments employing hired workers</i>		<i>Proportion of establishments in invaded departments to total establishments (Col. 2: Col. 3) per cent</i> <i>4</i>	<i>Proportion of active population in invaded departments to total active population per cent</i> <i>5</i>	<i>Proportion of percentage in Col. 5 to percentage in Col. 4</i> <i>6</i>
	<i>In the ten invaded departments</i> <i>2</i>	<i>In the whole of France</i> <i>3</i>			
Food	15,658	88,000	17.8	20.4	1.1
Chemicals	901	5,218	17.2	17.6	1
Rubber, paper	260	2,364	10.9	15	1.4
Printing, etc.	885	6,760	13	13	1
Textiles	12,180	37,435	32.2	43.2	1.3
Manufacture of textile goods	17,988	140,670	12.7	14.4	1.1
Straw, feathers, hair	1,628	4,662	34.9	28.8	0.8
Leather and skins	6,218	38,304	16.2	16	1
Wood-work	15,784	108,864	14.4	15.9	1.1
Metallurgy	58	172	33.7	62.1	1.8
Ordinary metals	12,736	81,287	15.6	20	1.3
Precious metals	60	2,435	2.4	4.1	1.7
Precious stones	.....	565	..	..	1
Stone-cutting	828	5,640	14.6	16.1	1.1
Earthwork, building	12,016	70,903	16.9	16.1	0.9
Glass and pottery	1,429	9,022	15.8	28.3	1.8
Total manufacturing industries	98,629	602,301	16.4	21.1	1.3
Total all industries	273,828	2,313,518	11.8	..	..
Total active population	....	....	..	14.4	..

APPENDIX IV

VARIATIONS IN NUMBER OF FEMALE STAFF
EMPLOYED IN 52,278 INDUSTRIAL ESTAB-
LISHMENTS, AUGUST 1914-JULY 1917

Industrial groups	Female staff	Percentage of pre-war staff employed				
	employed before the mobilization	In Aug. 1914	In July 1915	In July 1916	In Jan. 1917	In July 1917
Food industries	39,918	64	90	103	89	102
Chemical	14,959	54	99	137	159	164
Rubber, paper, etc.	21,683	40	74	90	94	97
Printing, binding, etc.	11,000	45	59	70	75	76
Textile industries	190,944	39	82	92	96	96
Manufacture of textile goods, straw, feath- ers, and hair	108,412	33	64	83	84	87
Leather and skins	22,596	40	78	97	103	107
Wood-working	9,047	27	78	115	140	154
Metallurgy, ordinary metals	18,815	50	343	629	846	913
Precious metals	2,883	17	52	69	70	68
Precious stones	1,306	27	58	71	73	80
Stone-cutting, earthwork, building	495	20	54	95	104	129
Lime, bricks, pottery, glass	17,153	19	43	61	67	69
Transport and storage	210	80	157	427	452	454
Various trades	33,053	57	80	93	96	101

APPENDIX VI

PROPORTION OF PRE-WAR PERSONNEL EMPLOYED IN EACH OF THE ELEVEN INDUSTRIAL DISTRICTS AT DATES OF PERIODICAL INQUIRIES (MINES AND TRANSPORT AND INVADED DISTRICTS EXCLUDED)

<i>Date of inquiry</i>	<i>July</i> <i>1914</i>	<i>Aug.</i> <i>1914</i>	<i>Oct.</i> <i>1914</i>	<i>Jan.</i> <i>1915</i>	<i>July</i> <i>1915</i>	<i>Jan.</i> <i>1916</i>	<i>July</i> <i>1916</i>	<i>Jan.</i> <i>1917</i>	<i>July</i> <i>1917</i>	<i>Jan.</i> <i>1918</i>	<i>July</i> <i>1918</i>	<i>Jan.</i> <i>1919</i>	<i>July</i> <i>1919</i>	<i>Jan.</i> <i>1920</i>
Paris														
Mean of 12 reports	100	29	33	48	64	79	96	121	127	126	121	106	..	..
Mean of 14 reports	100	29	33	49	63	77	93	117	120	120	115	100	91	100
Limoges														86
Mean of 12 reports	100	46	53	60	68	77	82	87	87	94	98	90	..	..
Mean of 14 reports	100	46	53	60	69	77	84	87	89	95	97	91	96	96
Dijon														77
Mean of 12 reports	100	25	37	52	66	71	85	83	93	99	100	94	..	..
Mean of 14 reports	100	23	37	52	66	71	85	85	92	99	98	93	95	100
Nancy														73
Mean of 12 reports	100	10	21	40	46	57	60	61	71	69	68	66	..	..
Mean of 14 reports	100	..	..	..	..	..	..	..	..	..	..	..	..	..
Calais														52
Mean of 12 reports	100	46	37	53	62	80	93	106	111	107	99	101	..	..
Mean of 14 reports	100	..	..	..	..	..	..	..	..	..	..	..	..	..
Rouen														81
Mean of 12 reports	100	39	65	74	80	89	99	114	117	125	130	125	..	..
Mean of 14 reports	100	39	65	73	80	89	98	112	115	123	122	109	101	118

APPENDIX VI (Continued)

<i>Date of inquiry</i>	<i>July</i> <i>1914</i>	<i>Aug.</i> <i>1914</i>	<i>Oct.</i> <i>1914</i>	<i>Jan.</i> <i>1915</i>	<i>July</i> <i>1915</i>	<i>Jan.</i> <i>1916</i>	<i>July</i> <i>1916</i>	<i>Jan.</i> <i>1917</i>	<i>July</i> <i>1917</i>	<i>Jan.</i> <i>1918</i>	<i>July</i> <i>1918</i>	<i>Jan.</i> <i>1919</i>	<i>July</i> <i>1919</i>	<i>Jan.</i> <i>1920</i>
Nantes														
Mean of 12 reports	100	46	58	59	67	70	72	71	65	67	63	65	..	64
Mean of 14 reports	100	45	58	58	64	68	69	70	66	66	63	64	64	65
Bordeaux														
Mean of 12 reports	100	49	59	69	79	92	108	120	125	123	120	108	..	91
Mean of 14 reports	100	49	59	69	80	92	108	120	126	123	120	108	107	109
Toulouse														
Mean of 12 reports	100	27	40	57	77	86	103	110	116	123	113	93	..	86
Mean of 14 reports	100	27	40	59	77	88	101	112	114	124	111	102	113	124
Marseilles														
Mean of 12 reports	100	37	48	59	69	80	85	89	91	90	88	82	..	74
Mean of 14 reports	100	38	48	59	69	79	85	89	91	89	88	83	85	87
Lyons														
Mean of 12 reports	100	39	51	67	80	97	104	109	110	109	102	86	..	87
Mean of 14 reports	100	39	51	66	82	94	104	105	110	106	101	98	108	134
General average of														
12 reports	100	34	44	57	68	80	89	97	100	100	95	87	..	77
14 reports	100	34	44	56	67	77	86	93	96	96	91	80	..	..

Note: The upper figure for each district and at each date gives the percentage of pre-war personnel employed at that date calculated on the numbers relating thereto recorded in successive reports down to January 1919; the lower figure gives the same percentage calculated on the numbers recorded down to January 1920. The lower figure has not been calculated in respect to the invaded districts (Nancy and Calais) for the reason given in the text. The figures in the table relating to Nancy and Calais, and the general average figures, refer to so much of the territory as remained to the S. W. of the stabilized front.

APPENDIX VII

ANALYSIS OF INDUSTRIAL ACTIVITY BY DISTRICTS

<i>Date</i>	<i>Three districts with lowest industrial activity</i>	<i>Three districts with highest industrial activity</i>	<i>Districts with more employment than before the war</i>	
August 1914	Nancy Dijon Toulouse	Bordeaux Limoges Nantes Calais }	None	
October 1914	Nancy Paris Dijon } Calais }	Rouen Bordeaux Nantes	None	
January 1915	Nancy Paris Dijon Calais	Rouen Bordeaux Lyons	None	
July 1915	Nancy Calais Paris	Lyons Bordeaux Rouen	None	
January 1916	Nancy Nantes Dijon	Lyons Bordeaux Rouen	None	
July 1916	Nancy Nantes Limoges	Bordeaux Lyons Toulouse	Bordeaux Lyons Toulouse	
January 1917	Nancy Nantes Dijon	Paris Bordeaux Rouen	Bordeaux Paris Rouen Toulouse Lyons	
July 1917	Nantes Nancy Limoges	Paris Bordeaux Rouen	Paris Rouen Bordeaux	Toulouse Lyons Calais
January 1918	Nantes Nancy Marseilles	Paris Rouen Bordeaux Toulouse	Paris Rouen Bordeaux Toulouse Lyons	
July 1918	Nantes Nancy Marseilles	Rouen Paris Bordeaux	Rouen Paris Bordeaux Toulouse Lyons	
January 1919	Nantes Nancy Marseilles	Rouen Bordeaux Paris	Rouen Bordeaux Paris Calais	

APPENDIX VIII

COAL-MINES

<i>Years</i>	<i>Total numbers employed in French coal-mines</i>	<i>Proportion of per- sonnel of coal-mines not occupied by the enemy to their pre- war personnel</i>	<i>Proportion of per- sonnel employed in coal-mines not occu- pied by the enemy to total personnel em- ployed in coal-mines before the war</i>
1913	203,208 (all coal-mines in French territory)		100
1914 (1st half)	205,486 “ “	100	
1914 (2nd half)	92,086 (excluding mines oc- cupied by enemy)		
1915	105,672 “	100	52
1916	116,983 “	117	57
1917	167,414 “	167	82
1918	168,528 “	169	82
1919	173,232 (all coal-mines in French territory)		85

APPENDIX IX

PERCENTAGE OF PERSONNEL EMPLOYED IN THE SEVERAL INDUSTRIAL GROUPS AT VARIOUS PERIODS

<i>Date of return</i>	<i>July 1914</i>	<i>Aug. 1914</i>	<i>Oct. 1914</i>	<i>Jan. 1915</i>	<i>July 1915</i>	<i>Jan. 1916</i>	<i>July 1916</i>	<i>Jan. 1917</i>	<i>July 1917</i>	<i>Jan. 1918</i>	<i>July 1918</i>	<i>Jan. 1919</i>
Food	100	49	61	69	75	79	83	81	85	76	67	67
Chemicals	100	42	51	66	79	93	102	119	120	119	116	103
Rubber, paper, etc.	100	33	42	53	62	69	74	72	78	79	76	72
Printing, binding, etc.	100	33	34	42	47	49	53	56	55	56	56	60
Textiles	100	34	50	63	71	76	78	81	82	81	79	80
Manufacture of textile, straw, etc., goods	100	31	43	45	65	72	77	78	79	83	85	87
Leather and skins	100	37	49	64	73	78	83	83	85	84	83	75
Wood-working	100	21	26	39	49	60	71	68	84	88	93	82
Metallurgy ordinary	100	33	43	63	82	110	135	159	167	143	153	120
Precious metals	100	11	9	24	36	46	60	63	68	68	66	63
Precious stones	100	19	16	32	44	48	50	51	52	54	53	54
Stone-cutting, carthwork, etc.	100	20	25	26	34	39	44	46	51	52	60	60
Lime, bricks, pottery, glass	100	20	24	34	40	46	48	55	56	57	56	55
Transport and storage	100	46	51	63	79	90	96	98	97	100	98	105
Various trades	100	49	52	56	62	68	70	70	72	72	73	72
General index-number	100	34	44	57	68	80	89	97	100	100	95	87

APPENDIX X

ANALYSIS OF INDUSTRIAL ACTIVITY BY
INDUSTRIAL GROUPS

<i>Date</i>	<i>Four groups with lowest industrial activity</i>	<i>Four groups with highest industrial activity</i>
August 1914	Precious metals Precious stones Building Pottery and glass	Food Various trades Transport Chemicals
January 1915	Precious metals Building Precious stones Pottery and glass	Food Chemicals Leather { Metallurgy } Transport
July 1915	Building Precious metals Pottery and glass Precious stones	Metallurgy Chemicals Transport Food
January 1916	Building Pottery and glass Precious metals Precious stones	Metallurgy Chemicals Transport Food
July 1916	Building Pottery and glass Precious stones Printing and binding	Metallurgy Chemicals Transport { Leather } Food
January 1917	Building Precious stones Pottery and glass Printing and binding	Metallurgy Chemicals Transport Leather
July 1917	Building Precious stones Pottery and glass Printing and binding	Metallurgy Chemicals Transport { Leather } Food
January 1918	Building Precious stones Printing and binding Pottery and glass	Metallurgy Chemicals Transport Wood-working
July 1918	Precious stones Pottery and glass Printing and binding Building	Metallurgy Chemicals Transport Wood-working
January 1919	Building Precious stones Pottery and glass Printing and binding	Metallurgy Chemicals Transport Wood-working

APPENDIX XI

RETURN, BY INDUSTRIAL GROUPS, OF PROPORTION
OF PERSONNEL EMPLOYED AT VARIOUS DATES,
IN CERTAIN INDUSTRIAL ESTABLISHMENTS
INSPECTED ABOUT JANUARY 1ST, 1920

Industrial group	Percentage of staff employed in								
	July 1914	Aug. 1914	Jan. 1915	Jan. 1916	Jan. 1917	Jan. 1918	Jan. 1919	July 1919	Jan. 1920
Food industries	100	54	63	68	75	67	67	74	78
Chemical industries	100	45	66	92	106	108	102	96	80
Paper, etc.	100	39	56	69	73	79	77	88	94
Printing, binding	100	39	41	46	51	52	56	60	66
Textiles	100	50	46	55	57	58	60	66	85
Clothing, etc.	100	37	50	63	67	70	75	79	89
Leather and skins	100	34	56	67	74	80	85	93	98
Wood-working	100	26	40	54	75	76	73	76	87
Metallurgy, ordinary metals	100	30	51	77	112	119	105	101	109
Precious metals	100	11	32	48	53	57	64	81	95
Precious stones	100	20	37	46	51	55	55	59	64
Stone-cutting, build- ing	100	21	17	25	29	43	49	94	117
Pottery and glass	100	16	30	43	48	52	55	64	65
Transport	100	45	52	64	75	71	88	99	117
Various trades	100	48	53	59	64	67	72	81	87

APPENDIX XII

STRIKES

<i>Year</i>	<i>1912</i>	<i>1913</i>	<i>1914</i>	<i>1915</i>	<i>1916</i>	<i>1917</i>	<i>1918</i>	<i>1919</i>
Number of strikes	1,116	1,073	672	98	314	696	499	2,026
Number of strikers	267,627	220,448	160,566	9,344	41,409	293,810	176,187	1,160,718
Successful strikes								
No.	193	183	129	23	73	191	100	501
Strikers involved	18,130	86,665	13,105	2,012	13,059	71,176	20,644	205,309
Compromised strikes								
No.	382	371	217	31	115	374	241	1,082
Strikers involved	71,406	5,466	56,839	4,674	21,018	198,848	102,173	778,527
Unsuccessful strikes								
No.	541	519	326	44	26	106	112	443
Strikers involved	178,091	68,317	90,622	2,658	7,332	20,261	37,002	176,882
Percentage of unsuccessful strikers	66.54	30.99	56.44	28.50	17.71	6.89	21.00	15.24

APPENDIX XIII

WAGES OF MINERS

The rates are in francs per day, the average daily rates being based on the actual yearly rates.

For the purpose of the index-numbers the rates for 1913-1914 are taken as 100.

<i>Year</i>	1913	1914	1915	1916	1917	1918	1919	1920
Pas-de-Calais								
Underground and surface								
Francs	5.72	....	5.40	6.02	7.63	11.67	15.62	20.85
Index	....	100	94	105	133	204	276	365
Underground								
Francs	....	7.48	7.23	7.88	9.76	14.20	....	....
Index	....	100	97	105	130	190	....	....
Surface								
Francs	....	4.04	3.99	4.76	6.73	10.63	....	....
Index	....	100	99	118	167	263	....	....
Loire								
Underground and surface								
Francs	4.06	....	4.91	5.56	6.85	10.27	13.12	20.51
Index	....	100	121	137	169	253	323	505
Underground								
Francs	....	7.14	7.79	8.35	10.48	16.60	....	....
Index	....	100	....	117	147	232	....	....
Surface								
Francs	....	4.41	4.48	5.13	7.21	11.39	....	....
Index	....	100	....	116	163	258	....	....
Whole of France								
Underground and surface								
Francs	5.40	....	4.78	5.49	6.92	10.12	13.44	19.90
Index	....	100	89	102	128	187	249	369

APPENDIX XIV

AVERAGE DAILY WAGE IN SUGAR-FACTORIES

<i>Season</i>	<i>Men</i>		<i>Women</i>		<i>Children</i>	
	<i>Wage in francs</i>	<i>Index-number</i>	<i>Wage in francs</i>	<i>Index-number</i>	<i>Wage in francs</i>	<i>Index-number</i>
1912-1913	4.56	100	2.49	100	1.97	100
1915-1916	5.18	114	3.12	125	2.69	137
1916-1917	6.02	132	3.57	143	3.44	174
1917-1918	7.07	155	4.61	185	4.23	215
1918-1919	9.00	197	6.40	257	5.17	262
1919-1920	13.70	300	8.13	327	6.41	325
1920-1921	19.83	435	10.60	426	8.47	430

APPENDIX XV

INDEX-NUMBERS OF RETAIL PRICES IN VARIOUS
COUNTRIES (PRICES IN JULY 1914 = 100)

Number of commodities	<i>France</i> <i>Towns of</i> <i>10,000 inhabitants</i>	<i>Paris</i>	<i>Great Britain</i> <i>600 towns</i>	<i>Italy</i> <i>Milan</i>	<i>United States</i> <i>45 towns</i>
	13*	13*	21†	18†	15†
1914					
July	..	100	100	100	100
October	100	..	112	..	103
1915					
January	110	122	118	..	101
April	..	116	124	..	97
July	123	122	132	..	98
October	..	120	140	..	101
1916					
January	133	137	147	..	105
April	137	135	155	..	107
July	142	132	161	..	109
October	146	138	168	..	119
1917					
January	154	139	189	170	125
April	171	147	198	190	142
July	184	183	202	210	143
October	200	184	206	224	154
1918					
January	212	191	208	248	157
April	233	218	207	291	150
July	244	206	218	325	164
October	261	237	233	378	178
1919					
January	..	248	230	399	181
February	278	..	..	..	..
April	..	257	207	363	178
May	294	..	..	..	..
July	..	261	217	310	186
August	289	..	..	..	..
October	..	283	231	348	184
November	302	..	..	..	..
1920					
January	..	290	235	412	197
February	321	..	..	..	..
April	..	358	246	423	207
May	380	..	..	..	..
July	..	373	262	445	215
August	390	..	..	..	..
October	..	420	291	480	194
November	452	..	..	..	..

* Of which eleven were food-stuffs.

† All food-stuffs.

APPENDIX XVI

PURCHASING POWER OF WAGES IN VARIOUS INDUSTRIES IN THE FIRST HALF OF 1921 AS COMPARED WITH 1911

<i>Industries</i>	<i>1911</i>	<i>1921 (1st half-year)</i>
Coal-mining		
Underground workers	100*	106
Under and above ground workers	100*	116
Manufacture of metals		
Turners (Paris)	100	110
Turners (other towns)	100	106
Laborers	100†	127
Building		
Masons (Paris)	100	107
Masons (other towns)	100	113
Carpenters (Paris)	100	101
Carpenters (other towns)	100	110
Painters (Paris)	100	126
Painters (other towns)	100	112
Laborers	100	117
Textiles		
Weavers	100	119
Cotton-spinners (Roubaix)	100	116
Wool-spinners (Roubaix)	100	100
Wool-spinners (Fourmies)	100	133
Agriculture		
Male adults	100	117
Public Service employees (Paris)		
earning yearly salary of 3,000 francs and under	100	128
earning yearly salary of 3,000 to 6,000 francs	100	81
earning yearly salary of 6,000 to 12,000 francs	100	64
earning yearly salary of 12,000 to 25,000 francs	100	48
earning yearly salary of 25,000 francs and over	100	36

* 1st quarter of 1914.

† 1913.

APPENDIX XVII

VARIATION IN WHOLESALE PRICES OF THE CHIEF
INDUSTRIAL COMMODITIES

<i>Commodity</i>	<i>1914 francs</i>	<i>Maximum price Date</i>	<i>Price francs</i>	<i>1918 francs</i>
Coal	19	October 1918	160	160
Coke	34	October 1918	175	175
Cast iron	68	November 1917	320	310
Ordinary steel	145	November 1917	900	850
English tin	380	July 1918	1,320	1,160
Copper	170	February 1917	530	400
Ordinary zinc	175	February 1916	295	211
Lead	165	April 1917	200	150
Raw wool	300	October 1918	1,000	1,000
Cotton	170	September 1918	818	818
Jute, the ton	700	June 1918	1,300	600
Para rubber, the kilo	8	December 1915	11.50	9.75
Bicycles, each	200	1918	375	375
Turpentine	72	October 1918	325	325
Petrol	95	October 1918	250	250
Alcohol	43	October 1918	450	450
Linseed	60	July 1918	460	460
Copra	100	July 1917	470	420
Lard	70	July 1918	450	380
Soda	29.50	January 1918	120	120
Colza	75	July 1918	550	550
Ground-nuts	70	July 1918	460	460
Paraffin	26	December 1917	51	50
Waste paper	7.50	January 1918	110	80

APPENDIX XVIII

STATISTICS OF STEAM-POWER EMPLOYED

<i>Branch of Industry</i>	<i>1919</i>		<i>1913</i>		<i>Percentage increase + or decrease — between 1913 and 1919</i>
	<i>Number of establishments</i>	<i>Power in thousands of kilowatts</i>	<i>Number of establishments</i>	<i>Power in thousands of kilowatts</i>	
Electric power production	672	497	804	576	—14
Manufacture of metals	2,240	495	3,471	437	+10
Mines, quarries	2,413	356	2,993	423	—15
Textiles and clothing	4,479	331	5,983	396	—16
Building, etc.	8,816	194	9,896	176	+10
Food	8,228	163	10,735	173	— 5.8
Agriculture	19,532	148	22,019	141	+ 5
Chemicals, tannery	2,961	105	3,635	106	— 1
Paper, printing	697	81	821	79	+ 2.5
Government services	239	61	626	59	+ 3.4
Furniture, implements	1,538	34	2,110	36	— 5.6
	51,815	2,465	63,093	2,602	— 5.2

APPENDIX XIX

FRENCH FOREIGN AND COLONIAL TRADE
(EXCLUDING RE-EXPORTS)

<i>Years</i>	<i>Imports</i>			<i>Exports</i>		
	<i>Total weight including imports from colonies</i>	<i>Value</i>		<i>Total weight</i>	<i>Value</i>	
		<i>Total</i>	<i>From French colonies</i>		<i>Total</i>	<i>To French colonies</i>
	<i>tons</i>	<i>millions of francs</i>	<i>millions of francs</i>	<i>tons</i>	<i>millions of francs</i>	<i>millions of francs</i>
1890	22,706,420	4,436	....	6,740,417	3,753	....
1900	28,271,512	4,697	364	8,593,038	4,108	478
1910	35,718,354	7,173	922	15,512,702	6,233	741
1913	44,220,386	8,241	797	22,074,513	6,880	895
1914	33,434,590	6,402	750	17,663,824	4,868	721
1915	33,049,256	11,035	1,121	4,091,075	3,937	595
1916	40,090,616	20,640	1,259	3,730,015	6,214	820
1917	34,832,608	27,554	1,990	3,011,124	6,012	801
1918	29,351,651	22,306	1,476	3,718,152	4,722	863
1919	38,447,165	35,799	3,638	5,564,360	11,879	1,548
1920	50,537,926	49,904	3,528	12,855,238	26,894	4,029
1921	37,973,685	23,518	3,129	16,001,427	21,553	2,664

APPENDIX XX

FRENCH IMPORTS AND EXPORTS IN 1913

<i>Total</i>	<i>Imports</i> 8,421 million francs		<i>Exports</i> 6,880 million francs
	<i>per cent</i>		<i>per cent</i>
Food-stuffs	18.4		10
Raw materials			
Wool	8	}	6
Cotton	7		
Silk	4.3		2
Flax	1.3		
Coal	7		
Oil and petrol	1.6		
Copper	2.2		
Mineral ore and other mineral products	3		
Oil-seeds	4.6		
Wood	2.4		
Rubber	1.4		
Hides	2.9		2.6
		Fuel	2.6
		Chemical products	3
Various	7.9		7
	<hr/>		<hr/>
Total raw materials	53.6		23.2
Manufactured articles and vari- ous			
Machinery	3.8	Yarn	2.1
Textile fabrics	2	Silk fabrics	6
Paper	1.1	Cotton fabrics	6
Various	5.3	Woolen fabrics	3.2
		Clothing	3.6
		Paper	2.5
		Dressed skins	2.2
		Motor-cars	3.3
		Toys and fancy goods	2.9
		Machinery	1.8
		Metal work	1.7
		Parcel post	8
		Various	23.5
	<hr/>		<hr/>
Total manufactured articles	12.2		66.8
Various goods	15.8		
	<hr/>		<hr/>
	100		100

APPENDIX XXI

FRENCH IMPORTS AND EXPORTS; WEIGHT IN THOUSANDS OF QUINTALS,* VALUES IN MILLIONS OF FRANCS

Category	Imports										
	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	
Manufactured articles											
weight	13,457	15,478	9,445	9,918	17,117	21,567	15,377	18,280	24,649	15,588	
value	1,614	1,658	1,081	3,068	5,829	8,692	6,596	10,342	12,873	4,945	
Food-stuffs											
weight	46,609	55,119	52,246	62,807	79,229	67,078	49,153	69,814	61,952	40,664	
value	1,803	1,818	1,873	3,315	5,058	6,985	5,645	10,704	11,875	6,206	
Raw materials											
weight	337,389	371,607	272,655	257,768	304,560	259,681	228,987	296,377	418,778	324,485	
value	4,813	4,946	3,508	4,653	9,753	11,876	10,066	14,753	25,157	12,398	
Total											
weight	397,854	442,204	334,346	330,493	400,906	348,326	293,517	384,472	505,379	379,737	
value	8,231	8,421	6,402	11,036	20,640	27,554	22,306	35,799	49,904	23,548	
Manufactured articles											
weight	21,986	22,833	15,866	7,510	8,634	6,493	3,986	8,611	18,652	18,908	
value	3,418	3,617	2,576	2,341	4,218	4,082	2,813	7,388	16,963	12,809	

* A quintal is roughly equal to 220 lbs. To convert thousands of quintals roughly into thousands of tons, the figures should be divided by ten.

APPENDIX XXI (Continued)

Exports

Category	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921
Food-stuffs										
weight	13,639	14,567	9,738	8,896	5,624	4,013	2,680	5,299	12,576	12,271
value	850	839	646	619	589	499	420	1,190	2,613	1,932
Raw materials										
weight	167,328	182,992	100,815	24,390	22,884	19,445	30,353	41,564	97,091	128,585
value	1,945	1,858	1,299	708	1,085	1,095	998	2,444	6,114	5,559
Postal parcels containing										
Silk fabrics										
weight	5	4	3	1	1	2	1	1	1	1
value	37	43	24	7	9	18	9	21	48	22
Perfumery, etc.										
weight	309	349	216	115	157	157	161	166	232	249
value	463	523	324	172	313	319	483	837	1,158	1,231
Total										
weight	203,266	220,745	176,638	40,911	37,300	30,111	37,182	55,644	128,552	160,014
value	6,713	6,880	4,869	3,937	6,215	6,013	4,723	11,880	26,895	21,553

APPENDIX XXII

IMPORTS AND EXPORTS OF CERTAIN COMMODITIES BEFORE AND AFTER THE WAR

Commodity	Imports					Exports				
	1912	1913	1920	1921	1922	1912	1913	1920	1921	1922
Syrups and sweets, quintals*	15,648	15,601	16,369	5,601	9,903	32,739	35,974	44,554	41,734	34,612
Jam, quintals	7,494	12,663	25,150	12,216	14,469	13,003	11,320	35,752	39,073	31,703
Medicinal plants, quintals	132,856	139,661	131,103	84,290	91,112	56,508	78,422	79,745	52,623	52,417
Synthetic perfumery, quintals	990	1,153	1,082	410	793	519	147	1,815	1,736	1,677
Quinine, quintals	.....	.....	75	6	9	.....	.....	257	180	251
Santonin, kilost†	.....	.....	183	84	43	.....	.....	82	130	.....
Theobromin, quintals	.....	.....	4	4	6	.....	.....	95	32	11
Chloroform, quintals	.....	.....	241	.....	.....	64	71	256	119	58
Glycerine, quintals	5,216	5,271	11,423	603	1,647	83,103	84,560	36,898	29,694	32,978
Sulphuric acid, quintals	131,190	110,008	76,576	71,723	93,307	41,664	46,097	145,202	97,528	252,478
Aspirin, quintals	.....	.....	28	42	79	.....	.....	261	591	416
Manufactured dyes, cochineal, indigo, etc., quintals	33,552	38,682	4,623	13,661	22,848	83,394	81,814	55,143	23,914	30,441
Dyes derived from coal-tar, quintals	21,998	20,952	58,883	13,153	17,974	4,952	6,472	33,624	26,953	5,683
Photographic paper, quintals	1,668	2,240	1,424	1,527	1,927	1,263	1,027	5,115	3,276	2,919
Cinema films, quintals	2,485	2,133	2,059	1,580	1,291	2,263	3,955	4,718	5,585	5,898
Textile gloves										
cotton, quintals	360	354	33	22	7	25	7	983	376	456
wool, quintals	144	122	75	33	76	29	81	266	4,054	436
silk, quintals	28	23	154	218	70	2	1	2,072	2,060	705

* Quintal = 220 lbs. Quintals may be roughly converted into tons by dividing by ten.

† Kilo = 2.2 lbs.

APPENDIX XXII (Continued)

<i>Commodity</i>	<i>Imports</i>					<i>Exports</i>				
	1912	1913	1920	1921	1922	1912	1913	1920	1921	1922
Hair tissues (alpaca, etc.), quintals	5,062	4,614	5,029	1,326	3,596	597	2,086	7,818	7,027	2,471
Hats—felt, number	1,004,550	973,022	2,968,206	612,589	987,692	1,209,683	1,248,232	819,805	602,942	723,178
Hats—hair, leather, or fur, number	167,012	111,252	21,044	20,915	48,173	256,902	246,480	555,542	340,795	405,851
Boots and shoes, pairs	1,375,066	1,494,573	2,367,513	394,944	580,122	13,544	13,982	51,575	25,971	15,172
Toys, quintals	25,380	24,497	8,543	9,409	9,081	99,175	102,822	76,847	49,335	53,770
Iron and steel tools, quintals	47,327	47,985	68,140	30,087	27,715	64,612	65,942	92,078	129,018	80,327
Household implements, quintals	151,987	64,085	75,776	47,453	65,491	156,065	176,038	176,114	136,011	181,061
Other iron and steel articles, quintals	.....	86,939	166,594	97,658	61,157	244	298	1,375	1,782	451
Scientific glass, quintals	192	287	374	326	110					
Porcelain for electrical purposes, quintals	8,964	11,528	15,859	19,967	865	4,153	5,831	5,007	10,498	8,816
Imitation jewelry, quintals	3,896	3,803	1,040	1,113	1,515	1,515	2,317	5,615	3,791	4,512
Chronometers, number	16	10	23	56	25	27	6	794	5,080	458
Fireproof ware, quintals	1,232,306	1,245,185	1,406,983	1,035,662	984,764	159,079	161,129	154,526	180,661	126,750

APPENDIX XXIII

OUTPUT OF FRENCH METALLIFEROUS MINES (OTHER THAN IRON) IN TONS

<i>Nature of ore</i>	<i>1913</i>	<i>1914</i>		<i>1915</i>	<i>1916</i>	<i>1917</i>	<i>1918</i>	<i>1919</i>	<i>1920</i>
		<i>First half</i>	<i>Second half</i>						
Gold	153,009	45,306	12,469	13,077	23,518	24,343	6,155	12,165	6,954
Lead and silver	17,081	21,887	12,839	23,778	34,295	38,125	25,087	24,297	23,505
Zinc	46,577								
Copper	521	70	40	95	1,057	1,377	811	38	553
Antimony	20,872	3,036	380	6,353	19,037	19,453	10,020	4,123	5,601
Manganese	7,732	4,523	1,870	10,324	10,807	11,589	9,871	7,016	10,302
Tungsten	273	6,657	6,061	6,062	7,289	8,548	7,414	11,526	3,745
Iron pyrites	311,167	147,905	51,421	196,606	219,371	280,797	260,310	118,273	140,375
Tin									18
Totals	557,232	229,384	85,080	256,295	315,374	384,232	319,668	177,438	191,053

APPENDIX XXIV

OUTPUT OF NATURAL ASPHALT, etc., AND OF MINERAL OIL AND ASPHALTIC PRODUCTS IN TONS

		1914						
	1913	First half	Second half	1915	1916	1917	1918	1920
Natural asphalt	41,000	28,269	7,280	11,707	14,381	12,068	10,104	25,000
Bituminous schist	208,000	90,121	40,465	55,124	84,099	104,611	94,130	69,000
Mineral oil	.....	6,924	3,126	4,026	5,891	6,879	6,979	.....
Asphaltic products	.....	15,676	6,494	10,179	17,559	12,964	11,961	.....

IMPORTS OF MINERAL OIL

	1913	1914	1915	1916	1917	1918	1919
Heavy oils and oil residues (tons)	144,598	101,170	106,633	169,994	172,980	157,772	152,878
Petroleum, crude (thousands of hec- toliters)*	1,983	1,445	230	483	200	1	4
Petroleum, refined (thousands of hec- toliters)*	2,612	2,280	2,730	3,089	2,639	2,661	3,333
Petrol (thousands of hectoliters)*	2,444	2,466	3,027	4,639	5,096	6,485	4,247

* A hectoliter is approximately 22 gallons.

APPENDIX XXV

FOOD INDUSTRIES

	1913	<i>Imports (in tons and hectoliters)</i>			1917
		1914	1915	1916	
Preserved meat in boxes	2,967	3,893	9,554	18,537	15,325
Pâtés de foie gras	45	25	0.4	0.2	0
Meat extracts	406	194	340	348	174
Cheese	23,526	20,648	21,203	10,950	5,464
Butter	5,912	6,194	776	284	337
Preserved fish	11,505	10,355	20,301	23,533	34,273
Ship biscuits and bread	4,904	3,906	1,415	711	136
Semolina and farinaceous pastes	1,092	1,624	11,836	1,882	9,497
Sugar, unrefined	113,972	169,490	277,488	343,150	221,093
Sugar, refined	894	4,295	261,420	225,850	319,189
Preserved fruit and jam	1,323	578	2,274	1,793	2,816
Condensed milk	1,287	6,617	3,972	6,157	10,941
Chocolate	900	557	2,238	3,035	2,568
Edible oil	45,407	35,673	53,478	82,385	115,268
Preserved vegetables	2,228	1,439	1,454	7,694	6,917
Beer (in tons)	15,843	9,741	13,813	58,695	21,727
Cider (in hectoliters)	941	512	684	4,847	2,485
Brandy (in hectoliters of pure alcohol)	180,432	179,511	445,930	1,263,020	1,399,611
Liqueurs (in hectoliters)	3,648	2,688	2,388	3,632	137

APPENDIX XXV

(Continued)

<i>Imports (in tons and hectoliters)</i>		<i>Exports (in tons and hectoliters)</i>						
1918	1919	1913	1914	1915	1916	1917	1918	1919
32,831	49,977	2,501	1,879	672	1,032	951	1,193	5,917
0	0.8	233	167	264	376	213	248	272
82	385	106	49	63	65	23	17	36
5,073	6,912	14,245	10,126	6,188	5,309	3,358	2,009	2,794
484	5,801	17,400	17,970	20,215	8,570	3,052	1,071	451
18,616	32,723	7,332	5,605	4,618	4,596	1,872	501	4,738
194	170	593	1,123	3,966	3,643	1,014	325	3,328
3,519	12,980	1,355	1,748	3,241	1,958	1,039	115	717
124,022	267,355	26,710	3,434	1,261	610	504	187	580
65,352	359,745	163,274	101,143	97,382	91,317	83,073	61,267	77,071
183	12,539	3,554	2,698	2,912	2,236	1,157	765	802
5,415	17,747	1,760	1,367	2,224	758	172	45	577
320	1,516	2,131	1,692	1,518	1,746	1,193	673	4,670
35,637	115,021	57,796	46,002	48,218	28,246	14,175	3,169	6,833
2,469	6,267	16,217	12,511	8,851	6,812	6,125	5,062	6,810
879	12,665	13,626	11,285	16,376	28,891	24,113	10,779	3,913
7,876	12,680	22,965	20,622	5,700	9,915	3,120	3,887	4,650
633,683	639,390	81,307	219,462	149,329	126,249	67,638	3,351	142,008
46	257	53,100	37,611	25,150	30,182	19,935	15,494	24,154

APPENDIX XXVI

CHEMICAL INDUSTRIES

Production and consumption in 1913 (in tons)

	<i>Production</i>	<i>Imports</i>	<i>Exports</i>	<i>Consumption</i>
I. Principal Products				
Calcium carbide	32,000	3,700	7,964	27,736
Nitric acid	20,000	826	2,132	18,614
Hydrochloric acid	150,000	2,903	1,779	152,000
Sodium chloride	1,282,000	32,965	174,515	1,140,450
Sodium salts (sulphate, carbonate, caustic soda, etc.)	625,434	1,915	122,169	505,180
Chlorine	10,000	259	700	10,258
Chloride of lime	43,493	11	11,359	32,145
Sodium hypochlorite	6,362	....	....	6,362
Chlorates of sodium and potassium	6,894	8	1,735	5,167
Bromine	very small	80	....	80
Sulphuric acid (52° Baumé)	1,160,000	11,000	4,610	1,172,390
Sulphuric acid (66° Baumé)	58,000	....	....	58,000
Olein	6,000	....	....	6,000
II. Nitrogenous Fertilizers				
Nitrate of soda	<i>nil</i>	322,000*	5,000	317,000
Sulphate of ammonia, etc.	75,000	21,800	1,700	95,000
Crude ammonia	7,500	5,500	....	13,000
Cyanamide	7,500	500	....	8,000
Nitrate of lime	<i>nil</i>	9,500	....	9,500
Various (guanos, offal, etc.)	47,000	53,000	....	100,000
III. Potassic Fertilizers	18,000	138,000	4,700	151,300†
IV. Phosphatic Fertilizers				
Phosphates‡ (France)	300,000	940,790	21,142	1,219,648
(Algeria)	465,000§	....	....	....
(Tunisia)	2,000,000§	....	....	....
Superphosphates	1,965,000	100,000	145,000	1,920,000
Basic slag	735,000	58,000	400,000	400,000
Bone superphosphates	100,000	....	....	100,000
Ground phosphates	100,000	....	....	100,000

* Of which 290,000 were for agricultural purposes.

† Of which 112,000 were for agricultural purposes.

‡ Natural, not industrial, products.

§ Of the Algerian and Tunisian output, 786,226 tons were imported into France, and are included in the figure of 940,790.

APPENDIX XXVII

CHEMICAL INDUSTRIES, IMPORTS AND EXPORTS, IN TONS

	1913	1914	Imports 1915	1916	1917
Bromine	77	74	38	0.9	0.4
Iodine	23	45	86	63	17
Hydrochloric acid	2,903	2,305	1,553	1,154	780
Nitric acid	827	459	364	183	24
Sulphuric acid	9,901	5,562	23,167	63,337	50,165
Tannic acid and tannin	59,577	35,656	45,050	52,195	57,700
Tannic extracts	994	778	357	173	37
Potash, vegetable ash, etc.	11,251	4,445	1,189	674	480
Kelp, caustic soda, etc.	2,422	6,273	20,597	16,632	24,896
Sea-salt and rock-salt	32,966	38,680	32,996	60,578	23,213
Ammonia salts	21,827	9,016	29,544	64,139	94,649
Calcium carbide	3,700	3,384	1,897	16,145	25,181
Chlorate of potash, of soda, etc.	9	124	8,814	28,502	25,642
Chloride of potassium	46,138	30,352	699	357	1,424
Cyanamide and nitrate of lime	10,010	3,809	2,458	7,986	9,233
Other nitrates (of potassium, soda, etc.)	322,188	297,481	254,036	543,696	456,306
Superphosphate of lime	100,822	58,155	14,038	4,122	1,884
Chemical fertilizers	223,217	104,956	15,068	7,928	2,139
Chemical products of coal-tar	90,048	58,393	35,026	65,421	134,377
Dye-stuffs derived from coal-tar	2,095	1,360	1,072	4,216	24,388
Pencils and various leads	302	159	100	176	343
Ochers	1,790	907	196	446	198
Perfumes and soaps	1,560	493	1,153	473	677
Other soaps	1,753	1,932	6,417	7,835	25,232
Waxes and candles	58	20	721	1,651	1,985
Composite drugs					
Distilled water					
Alcoholic (hectoliters)*	5	7	5	2	3
Without alcohol (quintals)†	236	150	239	123	67
Undefined					
(Quintals)	693	562	6,732	1,547	345
(Value in francs)	43,894	70,967	82,539	96,842	50,936
Chloroform (quintals)	2	42	455	352	579
Photographic papers and films (quintals)	2,240	1,315	2,201	2,007	1,350
Cinematograph films (quintals)	2,133	1,585	652	1,080	729

* Hectoliter = 22 gallons.

† Quintal = 220 lbs.

APPENDIX XXVII

(Continued)

<i>Imports</i>		<i>Exports</i>						
1918	1919	1913	1914	1915	1916	1917	1918	1919
173	71	0.4	0.1	0.1	7	63	25	36
45	34	4	1	7	4	6	2	1
75	1,085	1,779	1,101	504	931	1,037	704	293
	39	2,133	1,388	18	1,032	1,052	8	367
918	1,552	4,149	2,193	610	1,484	1,945	1,577	3,539
72,200	135,200	139	18	8	11	8	7	31
90	1,224	93,945	63,419	17,910	13,245	18,655	15,212	13,788
161	956	5,231	4,268	411	179	175	73	792
26,053	13,549	100,235	63,173	13,091	34,433	28,291	21,570	88,138
20,927	44,924	174,515	108,421	25,618	27,795	15,982	5,916	32,204
54,965	27,682	1,733	2,030	7,725	13,406	6,078	429	396
33,094	15,969	6,770	5,895	3,966	1,480	650	1,388	1,598
12,963	1,321	1,735	1,315	8,848	22,118	19,482	12,389	3,777
1,285	1,048	127	75	302	17	413	222	2,821
8,592	6,389	839	373	64	5,511	6,395	....	8
258,755	168,958	5,993	2,593	2,267	11,820	7,329	472	478
6,170	12,062	145,226	117,231	59,823	12,363	3,851	2,684	6,209
1,724	6,448	403,296	247,621	7,833	7,179	3,892	629	180,552
79,813	28,830	8,197	4,554	577	966	1,091	1,585	3,085
27,678	2,575	422	385	155	165	346	129	159
298	234	84	47	48	66	52	39	68
166	335	34,721	30,625	14,233	14,327	11,961	6,606	8,610
276	712	5,555	4,132	3,900	4,716	3,951	2,662	6,333
6,137	14,188	35,185	33,233	27,238	24,251	13,436	10,645	16,614
151	1,111	3,246	3,058	2,673	2,695	2,134	1,085	2,213
....	....	3,702	6,116	1,022	1,255	1,149	1,112	1,532
88	389	6,214	4,606	3,537	5,038	3,049	1,952	2,143
165	955	quintals						
97,000	196,000	62,533	46,025	40,595	44,036	40,912	36,870	60,294
233	187	60	35	110	61	33	50	270
1,056	1,158	1,027	691	701	1,736	2,406	1,035	2,168
2,190	1,993	3,480	3,888	1,668	1,837	3,091	1,392	1,376

APPENDIX XXVIII

RUBBER, PAPER, CARDBOARD

	1913	1914	Imports (tons) 1915	1916	1917
<i>Rubber</i>					
Raw rubber and gutta-percha	15,348	10,178	11,702	15,526	19,889
Rubber sheets, vulcanized or not	313	187	251	393	1,079
Elastic tissues	148	111	135	273	534
Clothing and accessories	62	41	68	163	204
Rubber shoes	154	75	988	344	1,706
Tires (shocs and inner tubes)	1,310	796	359	1,850	1,929
Straps, tubes, valves, etc.	1,314	810	711	1,203	1,603
<i>Paper</i>					
Rags					
Waste paper	46,967	31,725	26,377	10,595	2,810
Woolen rags	10,447	6,826	2,309	1,873	1,043
Other rags	19,890	11,502	6,320	5,875	5,179
Pulp					
Mechanical	259,449	207,551	169,470	213,209	88,701
Chemical	205,500	111,164	113,402	149,503	71,608
Fancy and other papers	15,922	9,357	52,180	110,679	36,192
Wall-paper	1,738	1,000	30	23	31
Paper for reproduction and photography	260	157	237	246	210
<i>Cardboard</i>					
Cardboard in sheets, molded, shaped, etc.	2,098	1,559	2,650	15,773	31,963
Cardboard boxes or tubes	2,770	1,516	2,317	3,834	3,470
Decorated cardboard	343	203	127	129	126
Cardboard or pulp articles	325	175	41	81	65

APPENDIX XXVIII

(Continued)

<i>Imports (tons)</i>		<i>Exports (tons)</i>						
1918	1919	1913	1914	1915	1916	1917	1918	1919
16,697	27,047	9,405	5,731	2,055	2,537	3,009	2,256	9,077
842	1,206	....	....	....	33	37	18	117
617	1,025	153	149	173	77	137	74	188
120	357	71	45	84	76	64	525	218
2,625	612	36	39	32	51	81	62	98
845	8,055	4,244	3,911	3,373	3,908	3,722	2,409	7,237
1,377	2,068	1,334	1,022	541	649	567	433	1,562
885	4,851	828	1,027	563	229	1,059	27	374
985	1,522	37,844	23,386	25,318	13,621	15,865	8,381	22,504
3,187	7,469	68,490	43,233	23,849	12,599	16,884	5,751	27,444
148,609	167,303	59	120	23	6	32	3	15
105,292	108,063	595	205	156	117	194	2	25
44,724	70,050	42,946	35,455	27,828	30,932	24,246	20,959	20,436
28	548	1,532	1,099	286	313	203	118	606
187	228	730	502	249	280	250	122	364
8,228	8,102	3,085	2,505	1,217	1,285	1,320	810	1,127
1,991	3,248	731	587	453	385	306	210	320
64	150	285	163	120	256	179	101	161
77	229	65	93	54	65	82	33	115

APPENDIX XXIX

PRINTING AND BINDING

	<i>Imports (tons)</i>						
	1913	1914	1915	1916	1917	1918	1919
Books, in French and other languages	2,165	1,464	613	691	705	887	1,127
Newspapers and periodicals	2,331	1,667	1,948	2,624	2,425	1,558	1,521
Engravings and photographs	682	395	182	188	228	179	286
Cinematograph films	213	159	65	108	73	49	199
Labels and various printed papers	842	507	263	293	268	157	295
Engraved or printed music	235	146	16	18	25	20	27

	<i>Exports (tons)</i>						
	1913	1914	1915	1916	1917	1918	1919
Books, in French and other languages	4,355	3,150	1,729	2,146	1,962	1,382	2,328
Newspapers and periodicals	5,200	3,229	752	1,294	1,501	1,215	3,584
Engravings and photographs	477	328	166	258	183	72	335
Cinematograph films	348	389	167	184	309	139	138
Labels and various printed papers	3,551	2,792	1,784	1,605	1,739	770	1,216
Engraved or printed music	77	41	25	29	28	30	32

APPENDIX XXX

PRINTING AND BINDING INDUSTRY

	<i>Pre-war</i>	<i>1914</i>		<i>1915</i>		<i>1916</i>
		<i>Aug.</i>	<i>Oct.</i>	<i>Jan.</i>	<i>July</i>	<i>Jan.</i>
Wages of typographers in Paris	100	100	100	100	100	111
Printing	100	100	100	100	100	100
Cost of paper						
Average printing	100	100	100	100	100	150
Ordinary	100	110	120	130	150	200
Cost of binding						
Cloth	100	105	110	120	140	150
Paper boards	100	100	100	100	100	100
Sale price						
of the 3 fr. 50 novel						
absolute price	3 fr. 50	3 fr. 50	3 fr. 50	3 fr. 50	3 fr. 50	3 fr. 50
increase	100	100	100	100	100	100
of classical works	100	100	100	100	100	110
Contract price of supplies to public						
offices	100	100	100	100	110	110
Returns of labor inspectors						
Personnel employed	100	33	34	42	47	49
Establishments at work	100	52	61	67	76	80

APPENDIX XXX

(Continued)

<i>1916</i> <i>July</i>	<i>1917</i>		<i>1918</i>		<i>1919</i>		<i>1920</i> <i>July</i>	<i>Aug.</i>
	<i>Jan.</i>	<i>July</i>	<i>Jan.</i>	<i>July</i>	<i>Jan.</i>	<i>July</i>	<i>Jan.</i>	
111	122	133	144	155	166	277	277	355
100	100	130	140	140	150	200	400	..
200	200	250	400	500	380	350	400	..
300	275	350	500	650	600	400	700	..
175	200	230	400	450	600	650	800	..
120	150	175	300	310	320	350	400	..
3 fr. 50	3 fr. 50	3 fr. 50	4 fr. ..	4 fr. 50	4 fr. 50	4 fr. 50	5 fr. ..	7 fr. ..
100	100	100	114	129	129	129	143	200
120	120	120	170	170	200	200	270	..
110	129	142	170	180	180	280	316	..
53	56	55	56	56	60	60	66	..
82	83	86	86	89	89	89	97	..

APPENDIX XXXI

TEXTILE INDUSTRIES

	1913	1914	Imports (tons) 1915	1916	1917
<i>I. Textile materials</i>					
Wool in bulk, combed and carded wool, waste	285,570	214,568	68,100	85,181	66,281
Silk					
in cocoons	465	352	190	175	169
raw	7,169	4,942	4,525	4,208	4,940
other (floss, waste, etc.)	11,190	9,007	4,162	8,191	6,732
Cotton, raw and waste	329,136	205,673	228,159	255,479	273,290
Flax (including raw stalks at $\frac{1}{10}$ their weight)	112,195	75,269	2,175	12,689	7,240
Hemp	29,625	18,773	8,141	28,675	13,844
Jute	112,231	61,396	75,360	77,795	67,239
Ramie	905	198	333	1,023	822
<i>II. Yarns and fabrics</i>					
Wool					
yarn	956	670	4,643	6,896	6,955
fabric	4,317	4,126	32,836	42,889	23,805
Silk					
yarn	277	123	95	288	741
fabric	871	542	384	559	575
Cotton					
yarn	3,128	1,929	22,350	34,037	26,428
fabric	4,759	4,920	60,830	37,277	23,358
Flax, hemp and ramie					
yarn	646	449	1,337	4,044	9,142
fabric	5,106	3,393	2,248	3,019	6,729
Jute					
yarn	27	159	114	32	1,091
fabric	28,470	24,291	56,188	56,668	68,569
Totals (yarn and fabric)	48,556	40,602	181,024	185,810	167,392

APPENDIX XXXI

(Continued)

<i>Imports (tons)</i>		<i>Exports (tons)</i>						
1918	1919	1913	1914	1915	1916	1917	1918	1919
44,403	165,940	80,665	62,371	5,201	10,579	4,786	342	10,916
155	178	70	57	40	17	22	3	33
5,359	5,769	2,315	2,005	2,369	1,640	1,496	1,248	1,171
8,503	7,528	6,203	3,687	2,741	3,053	3,169	2,630	3,156
142,290	218,547	57,840	43,125	8,327	23,968	18,406	5,898	16,910
7,034	2,648	17,018	11,905	3,451	3,748	3,352	250	4,858
15,673	29,404	1,171	665	485	290	179	36	769
8,948	107,709	1,487	2,990	233	558	68	116	2,107
1,141	798	118	41	28	105	146	87	229
6,038	6,831	13,359	6,643	50	106	51	20	1,616
15,685	22,602	18,280	12,203	1,165	1,419	1,797	1,011	4,396
923	655	1,384	949	872	899	489	266	648
458	656	6,175	5,051	5,846	5,859	4,124	2,932	6,012
34,406	30,089	7,642	3,047	940	1,221	935	511	4,841
40,713	23,987	50,702	37,460	18,082	21,737	14,188	9,411	32,253
2,635	6,663	11,415	6,562	750	405	162	128	386
6,512	6,275	4,707	3,308	800	740	599	270	558
785	2,095	6,738	2,449	5,387	5,221	915	450	468
49,562	57,021	18,738	11,601	9,592	14,302	9,384	6,483	9,617
157,716	156,873	139,139	89,273	43,484	51,908	32,644	21,482	60,792

APPENDIX XXXII

MAKING OF TEXTILE GOODS AND CLOTHING; STRAW,
FEATHERS, AND HAIR INDUSTRY

	1913	1914	<i>Imports</i> 1915	1916	1917
Sewn linen goods, tons	79	182	1,552	654	782
Ready-made clothing, men's					
Silk, kilos	456	303	23	83	208
Other fabrics, kilos	203,919	141,131	2,009,271	189,021	95,660
Ready-made clothing, women's					
Silk, kilos	8,204	6,418	7,194	11,683	10,847
Other fabrics, kilos	98,624	49,426	39,655	41,156	34,879
Silk and other cravats, kilos	4,958	2,848	915	1,105	1,485
Sacks other than jute, tons	77	120	2,274	3,349	2,047
Miscellaneous ready-made articles, tons	237	474	4,587	1,693	291
Furs, worked and ready-made, tons	1,529	1,143	645	803	675
Felt for linings, pianos, papering, etc., tons	204	110	42	97	570
Hats (felt, hair, and fur), number	1,084,274	593,576	234,857	419,569	1,624,753
Corsets, number	79,886	47,856	8,757	17,643	17,395
Millinery,* tons	4	3	0.1	0.2	0.2
Value in francs	96,000	72,000	2,400	8,000	10,000
Artificial flowers,* tons	16	9	0.2	..	..
Value in francs	571,000	366,000	20,500	..	..
Umbrellas, number	63,920	26,376	13,181	31,764	16,049
Hair, tons	1,922	1,254	518	371	448
Feathers for trimming, kilos	810,202	541,728	203,961	197,530	152,688

* Statistics of exports and imports of millinery and artificial flowers are not available in respect to several years.

APPENDIX XXXII

(Continued)

<i>Imports</i>		<i>Exports</i>						
1918	1919	1913	1914	1915	1916	1917	1918	1919
1,093	1,045	1,365	946	590	555	592	309	518
648	1,000	6,055	5,848	8,799	4,495	6,570	7,232	20,400
84,295	198,600	1,540,205	1,315,664	268,864	262,012	450,954	215,609	547,680
4,577	8,916	59,132	40,335	59,557	66,045	61,384	83,321	283,342
24,542	39,979	1,165,392	815,674	566,178	522,851	346,000	168,084	285,972
1,229	2,533	4,747	2,628	3,418	3,014	3,690	4,182	11,848
1,728	1,960	37	50	19	62	89	14	55
324	434	1,319	796	585	439	909	580	693
630	999	1,673	1,225	842	1,127	905	1,230	1,442
226	212	422	294	210	373	264	187	330
1,606,646	2,115,712	1,494,712	1,037,366	652,108	678,272	698,557	748,931	835,823
573	19,856	209,250	113,313	104,394	132,648	71,769	96,176	179,325
0.1	0.3	1,753	989	..	328	..	..	..
5,500	36,000	56,648,357	38,208,168	3,678,972	5,522,428	6,989,129	6,262,730	11,393,000
..	1	1,651	1,221	..	1,742	..	..	..
..	51,500	19,102,388	16,201,219	23,163,132	25,022,140	13,323,287	12,200,600	21,293,000
8,592	10,255	1,065,936	742,433	312,843	274,640	226,398	165,799	139,171
310	982	426	335	226	223	250	38	174
97,910	250,704	1,076,475	715,004	519,505	449,215	342,196	297,077	349,045

APPENDIX XXXIII

LEATHER AND SKINS

	1913	1914	<i>Imports</i> 1915	1916	1917
Raw hides					
Heavy, tons	59,129	39,205	19,644	27,847	44,387
Light, tons	14,820	12,320	3,502	7,504	8,648
Raw pelts, tons	1,819	1,309	322	745	599
Dressed hides, tons	8,340	5,231	14,224	17,954	15,531
Artificial leather, tons	2	33	11	21	25
Leather articles, boot-soles and boot-legs, tons	22	15	223	444	307
Boots and shoes, pairs	1,502,973	1,012,925	4,142,838	3,710,455	2,567,051
Gloves, dozens of pairs	50,997	42,660	32,307	28,128	26,788
Saddlery					
Saddles, number	532	723	73,438	10,107	624
Other articles, tons	5	24	1,764	225	2
Harness, tons	7	137	1,669	1,129	32
Belts (for driving machinery), tons	287	160	292	530	656
Leather trunks, fancy leather goods, etc., tons	495	284	2,452	2,842	578
Peltry, dressed and manufactured, tons	1,529	1,143	645	803	675

APPENDIX XXXIII

(Continued)

<i>Imports</i>					<i>Exports</i>			
1918	1919	1913	1914	1915	1916	1917	1918	1919
14,830	51,448	36,775	27,676	13,655	6,881	6,116	1,920	19,112
5,423	17,188	26,499	15,751	6,281	4,472	3,098	66	5,275
542	1,372	3,932	2,209	1,501	2,423	2,840	1,567	2,769
3,918	20,531	14,372	9,955	4,261	4,868	3,045	2,299	3,759
37	57	256	185	60	58	7	24	204
138	327	88	39	22	13	44	35	38
1,220,434	3,837,130	tons 909*	709	299	505	585	341	1,293
27,673	31,670	tons 488	432	483	436	508	326	307
358	144}	tons 139	83	13	16	12	49	27
3	3{							
0.7	18							
402	672	411	272	94	85	103	105	320
114	432	1,147	896	690	570	611	343	376
630	999	1,673	1,225	842	1,127	905	1,230	1,442

* As regards boots and shoes, gloves and saddles, the Customs statistics give Imports in pairs, dozens of pairs, and numbers respectively; but the Exports in tons.

† This figure is surprising, but the Customs returns show that, in 1917, 724 tons of saddlery were exported to Russia, and 87 to Roumania, doubtless in connection with military equipments.

APPENDIX XXXIV

WOOD-WORKING INDUSTRIES (TONS, EXCEPT
WHERE OTHERWISE STATED)

	1913	1914	Imports 1915	1916	1917
<i>Common woods</i>					
Constructional timber of all kinds	1,562,179	821,220	374,268	975,163	557,421
Wood pavement	18	11	..	..	..
Barrel staves	78,957	51,840	26,075	17,574	16,275
Split wood, laths, and poles	153,014	120,169	17,884	7,208	3,238
Cork, raw, rasped, and sheets	12,318	7,048	5,794	8,496	4,422
Resinous woods	201,728	100,500	17,277	3,780	9,210
Wood-wool	1,610	833	201	335	338
Other common woods	80	29	26	22	..
Total common woods*	2,009,904	1,101,650	441,525	1,012,568	590,904
<i>Exotic woods</i>					
Fine woods of all kinds	80,171	58,208	14,228	8,888	7,579
Scented woods and dye-woods	85,011	75,163	98,825	75,379	57,867
<i>Furniture</i>					
Of bent wood	1,476	883	46	222	177
Of other wood, and upholstered furniture	5,199	2,835	349	498	484
Wooden frames	526	162	18	106	29
Barrels	6,537	4,857	4,409	3,914	3,312
Brooms	438	307	832	806	179
Carpenter's and wheelwright's work	2,180	2,120	1,397	2,714	4,352
Wooden shoes	9	6	38	125	148
Parquet	1,867	1,075	713	3,761	6,610
Doors and windows	998	522	63	1,405	1,937
Handles of implements	1,045	748	201	482	367
Pianos, grand and upright (number)	1,549	903	42	126	19
Vehicles for roads, including motors	2,745	2,714	41,186	32,551	40,685
Vehicles for rails and tramways	20,356	6,912	5,657	54,677	170,875
Acroplanes and sea-planes	..	0.4	..	..	25
Wooden boats (tons of capacity)	2,249	5,517	596	1,744	10,535
Hulls of ships (tons of capacity)	15	6	97	14	243
Hulls of river-vessels (tons of capacity)	3,598	1,673	581	1,455	216
Cork, worked, and corks	1,879	1,144	749	882	999
Toys and games	2,450	1,073	283	369	287

* Firewood is not included.

† This figure is missing from the Customs returns.

APPENDIX XXXIV

(Continued)

<i>Imports</i>		<i>Exports</i>						
1918	1919	1913	1914	1915	1916	1917	1918	1919
303,802	720,055	337,756	221,508	50,021	31,145	28,495	25,630	52,894
..	53	1,251	730	285	166	2	..	39
6,668	33,199	5,942	5,445	5,641	6,903	5,555	1,848	3,991
1,793	31,228	921,191	809,283	644,591	639,154	668,045	535,758	524,707
3,849	9,348	12,131	7,506	3,469	6,029	3,344	1,456	4,001
5,695	7,683	185	91	26	3	19	2	45
721	853	260	214	625	426	380	213	447
19	92	1,599	473	23	175	161	98	689
322,547	802,451	1,280,315	1,045,250	704,681	684,001	706,001	565,005	586,813
12,686	27,417	10,057	7,751	8,267	8,224	2,363	1,282	3,013
12,701	20,917	547	261	298	739	159	15	300
146	255	1,515	1,074	236	200	140	75	190
263	1,095	8,600	5,363	1,640	1,627	..†	644	1,282
8	453	287	188	61	77	65	35	150
2,467	11,403	85,821	74,048	115,649	84,484	81,534	28,677	6,879
580	1,281	587	521	290	309	272	178	291
2,160	8,530	4,426	1,938	944	1,547	820	772	2,934
9	169	259	144	64	33	56	83	89
7,195	16,119	1,755	1,047	333	347	325	164	275
10,459	14,282	1,536	1,221	235	300	1,379	812	866
402	761	1,073	907	496	279	191	132	371
15	153	4,421	2,730	2,069	2,430	1,611	773	1,499
21,687	25,239	26,895	15,317	6,331	6,569	2,674	601	6,846
97,498	256,350	5,613	6,113	513	758	342	188	5,289
261	29	142	132	292	805	610	1,746	357
24,417	49,960	2,839	1,165	558	96	217	359	271
6	75	8	10	..	3	1	1	..
297	739	223	118	165	473	47	6	322
555	2,210	1,047	750	380	422	348	291	1,059
145	445	8,226	5,342	4,450	4,282	3,304	2,428	2,838

APPENDIX XXXV

METALLURGY

	1913	1914	<i>Imports</i> 1915	1916	1917
Motors, stationary and marine, steam pumps, etc., tons	12,261	7,734	2,482	5,930	8,585
Railway locomotives, tons	5,807	4,432	2,288	8,324	18,707
Road locomotives, tons	1,164	443	325	3,399	5,010
Spinning and weaving machinery, tons	23,444	14,346	3,575	7,281	4,877
Printing machinery, tons	2,565	1,095	306	311	599
Agricultural machinery, tons	34,827	37,877	8,221	19,591	15,882
Sewing-machines, tons	8,555	4,961	1,736	2,421	3,250
Dynamos, tons	4,929	2,819	2,226	5,745	4,362
Machine-tools, tons	23,735	14,685	28,287	45,640	53,216
Machinery for flour-mills, etc., tons	14,901	8,744	4,388	13,658	24,337
Boilers, tons	3,442	1,817	1,269	2,899	3,560
Machinery for sugar manufacture, tons	60	41	41	45	3
Arc lamps, tons	16	7	0.5	1	3
Mechanics' tools* and other tools, tons	1,937	3,333	3,086	4,744	5,781
Needles for looms, kilos	13,677	7,686	2,468	7,624	8,315
Cutlery, tons	90	50	21	30	38
Constructional ironwork, tons	753	447	67	180	166
Household implements, tons	15,102	9,497	12,657	46,863	82,882
Body-work for motor and other vehicles, tons	2,745	2,721	41,186	32,551	40,685
Chassis and wheels for motors and other vehicles, tons	534	265	538	1,107	2,624
Motor-cycles and bicycles, tons	963	675	249	623	1,463

* To obtain the exact figures of imports of mechanics' tools the following quantities, assessed in values, should be added, francs

4,826,681 2,761,616 3,771,012 9,427,568 16,159,767

APPENDIX XXXV

(Continued)

<i>Imports</i>		<i>Exports</i>						
1918	1919	1913	1914	1915	1916	1917	1918	1919
6,615	9,581	2,043	1,486	665	2,668	1,123	338	761
26,559	22,266	1,261	2,715	439	4,956	1,278	521	14,563
7,381	13,205							
5,346	17,808	2,052	1,408	398	447	344	401	977
58	1,030	811	310	90	127	71	115	301
16,158	52,237	12,311	7,719	1,677	1,364	900	1,084	2,495
3,159	4,392	391	262	65	88	62	37	201
4,030	4,979	1,646	1,155	336	339	657	393	696
27,169	33,505	4,583	2,717	903	1,692	1,326	695	2,654
19,790	29,196	6,863	6,140	1,325	1,347	1,086	921	6,359
2,850	3,621	1,486	1,016	305	238	157	295	322
4	59	583	678	123	109	266	117	162
8	3	41	25	14	7	3	0.9	4
2,962	5,782	6,594	5,163	1,480	2,028	1,565	982	2,711
9,391	9,366	639	19	360	2,529	2,892	1,705	1,232
30	52	937	608	343	364	264	192	299
82	326	2,842	1,667	650	683	438	285	463
32,166	13,361	17,604	12,172	6,790	11,617	9,931	3,814	4,885
21,687	25,239	26,895	15,317	6,331	6,569	2,674	601	6,846
591	3,024	456	597	385	334	285	105	327
1,031	979	934	674	345	365	217	87	426

15,719,000 23,421,000

APPENDIX XXXVI

PRECIOUS METALS AND PRECIOUS STONES

	1913	1914	<i>Imports</i> 1915	1916	1917
Gold					
Ore, quintals*	10	99	14	..	..
Beaten, rolled, and wire, kilos	3,420	1,454	157	131	94
Bullion, kilos	93,307	130,768	12,977	20,730	23,559
Platinum					
Ore, quintals	1	5	..	..	1
Bullion, kilos	5,029	2,908	360	576	478
Beaten, rolled, and wire, kilos	37	13	..	2	..
Silver					
Ore, quintals	210	16	..	7	..
Beaten, rolled, and wire, kilos	2,053	7,016	501	1,674	606
Bullion, kilos	651,221	378,735	719,051	750,831	652,735
Goldsmiths' and silversmiths' work					
Gold, kilos	116	112	126	51	..
Platinum, kilos	17	17	..	4	1
Silver and silver gilt, kilos	8,420	4,164	3,343	903	707
Jewelry					
Gold, kilos	6,204	2,982	1,753	1,998	757
Platinum, kilos	68	15	2	7	2
Silver and silver gilt, kilos	8,155	4,004	1,681	4,713	2,745
Gilt or silvered, rolled and plated goods, kilos	135,266	65,959	14,740	24,562	13,765
Imitation jewelry, of all metals, quintals	3,803	2,242	475	618	354
Precious stones, hectograms†	153,326	87,454	29,411	137,588	66,982
Agate and rock-crystal, kilos	141,643	57,230	4,230	13,149	61,231

* Quintal = 220 lbs.

† Hectogram = 3.2 ozs., troy.

APPENDIX XXXVI

(Continued)

<i>Imports</i>		<i>Exports</i>						
1918	1919	1913	1914	1915	1916	1917	1918	1919
..	1	2	5	90	..	..	..	1
210	342	394	311	780	713	878	1,050	849
4,343	18,451	3,569	4,713	578	172	31	6	932
..	..	8	5	3	..	..	..	..
33	217	1,077	1,088	600	324	233	1	142
8	2	585	326	288	133	75	57	108
..	133	202	..	..	..	225	1,737	1
409	970	23,524	35,015	6,298	27,745	20,397	23,158	12,736
287,988	289,691	128,095	93,105	127,839	98,424	114,870	16,708	32,361
3	16	604	253	190	527	130	25	36
..	2	125	33	..	4	48	5	1
795	2,874	32,497	15,562	7,695	7,857	5,239	7,912	11,279
137	856	1,998	523	256	690	292	235	563
..	2	208	203	6	14	24	24	28
421	4,084	13,034	5,347	3,484	4,016	2,456	2,750	2,775
10,138	42,772	240,751	144,859	90,802	186,372	168,110	151,119	297,076
287	433	1,622	1,538	1,554	1,403	1,343	1,817	2,764
13,835	51,923	..	..	..	..	9,514	2,701	32,093
8,225	41,494	47,333	55,868	8,820	12,720	34,983	20,061	67,780

APPENDIX XXXVII

BUILDING AND PUBLIC WORKS

	1913	1914	<i>Imports</i> 1915	1916	1917
Statuary and other marble, and alabaster, tons	59,630	40,154	3,666	8,570	9,204
Stone, worked, cut, or sawn, tons	64,120	35,416	584	3,236	347
Sculptured stone, chimney-pieces, funeral monuments, tons	4,010	2,098	151	459	188
Millstones, number	606	2,045	32	26	8
Grindstones, tons	5,573	1,875	69	71	38
Stones and earths used in industry and art, tons	1,483,751	1,000,209	375,834	391,873	231,969
Slates, tons	2,705	1,208	218	239	220
Bricks, tons	77,290	29,953	1,450	6,368	10,746
Tiles, ordinary, tons	781	679	38	72	80
Tiles, machine made, tons	8,973	4,148	178	746	6,118
Constructional stone, tons	89,836	46,669	3,369	2,098	3,134
Paving-stones and road-metal, tons	981,552	664,388	1,335	1,648	643
Plaster,* tons	8,247	3,432	71	176	567
Cement pipes and slabs, etc., tons	717,008	369,381	4,271	3,131	1,370
Bitumen and asphalt, tons	58,215	38,470	25,596	24,381	12,313

* For lime and cement see Appendix XXXVIII.

APPENDIX XXXVII

(Continued)

<i>Imports</i>		<i>Exports</i>						
1918	1919	1913	1914	1915	1916	1917	1918	1919
7,158	25,118	11,075	6,501	1,514	2,009	1,880	1,592	5,934
210	10,805	19,685	8,888	2,375	1,676	775	1,265	1,300
110	908	2,051	1,193	235	650	256	1,870	352
770	50	21,692	14,016	3,169	5,033	2,869	2,075	6,166
55	166	3,970	1,982	1,086	1,872	755	392	1,389
319,955	652,180	549,023	394,678	223,030	268,061	219,442	144,637	148,914
369	3,042	38,061	20,802	2,975	986	596	103	2,153
3,268	34,259	70,663	43,142	20,456	7,461	5,680	1,895	4,793
229	3,136	169,102	110,095	23,424	18,443	17,186	6,771	16,582
847	33,687	39,263	22,551	7,748	9,180	6,129	4,827	7,139
2,982	4,524	165,901	80,082	13,228	13,047	6,889	1,478	12,448
288	98,663	44,746	28,652	38,730	3,725	1,361	345	14,085
499	3,758	172,574	89,163	16,376	8,537	4,545	1,163	20,315
927	93,777	128,541	103,167	52,178	24,557	21,226	25,322	36,000
4,850	13,258	20,417	14,492	9,784	4,829	2,189	879	2,555

	<i>Imports</i>						<i>Exports</i>					
	1913	1915	1916	1917	1919		1913	1915	1916	1917	1919	
I.rine and cement												
Ordinary lime, tons	215,999	502	462	221	67,047		130,892	3,379	3,082	2,901	21,050	
Hydraulic lime, tons	262,597	385	365	280	121,967		262,313	82,739	57,052	22,891	23,596	
Slow-setting cement, tons	112,200	27,494	108,255	133,603	118,217	{						
Quick-setting cement, tons	8,240	881	938	211	2,013		398,240	141,602	117,711	64,376	73,331	
Graphite, tons	3,796	5,039	13,690	17,627	5,051		751	3,139	5,508	4,997	1,236	
Pottery												
Crucibles and retorts, tons	6,033	337	916	1,082	1,944	{						
Fire clay bricks and pottery, tons	63,512	2,818	9,326	6,704	30,370							
Silica and alumina bricks, tons	52,879	10,685	28,694	22,006	13,181		16,113	6,070	7,956	7,081	5,295	
Graphite and plumbago crucibles, tons	2,095	1,863	4,939	5,090	1,359							
Flowerpots, tons	589	23	..	..	117		378	27	14	8	20	
Other pottery, tons	985	226	238	208	555		4,267	1,356	1,341	613	1,129	
Stone-ware, tons	1,660	1,251	4,260	1,559	2,080		2,281	803	638	332	469	
Paving tiles, tons	3,201	212	68	33	2,752		52,624	13,586	10,843	5,484	10,522	
Earthenware, tons	6,453	312	511	759	3,323		11,780	1,897	1,961	1,149	1,551	
Porcelain, tons	4,699	398	535	230	689		8,023	3,897	4,122	2,678	2,400	
Glass												
Mirrors, less than ½ meter square, tons	544	14	70	44	431		322	280	268	88	74	
All other sizes, sq. meters	114,035	7,056	9,202	4,506	119,598		..	..	..	..	..
Mirrors of all sizes, value in francs	2,319,716	203,635	408,739	343,320	13,707,362		3,515,413	2,149,093	1,732,815	615,370	1,480,840	
Unpolished glass, tons	599	1,217	4,907	3,033	15,203		5,911	349	135	43	51	
Table glass, tons	5,849	152	187	85	1,053		11,371	2,736	2,192	1,684	1,997	
Glass for illumination, tons	3,684	352	1,856	890	710		235	61	73	688	187	
Window-glass, tons	3,639	6,761	9,989	7,153	39,990		6,116	682	549	581	490	
Watch and clock glasses, tons	34	3	11	12	113		27	14	14	9	151	
Optical glass, tons	63	4	26	11	3		184	127	93	48	87	
Bottles and phials, tons	8,919	11,722	28,802	17,255	23,919		115,817	55,251	55,787	30,695	53,754	
Electric bulbs, tons	115	21	1,238	146	246		112	75	61	60	46	

APPENDIX XXXIX

COMMERCIAL RAILWAY TRAFFIC

<i>Line</i>	<i>By passenger train</i>			<i>By goods train</i>	
	<i>Number of passengers</i>		<i>Goods thousands of tons</i>	<i>All distances thousands of tons</i>	<i>Per kilometer millions of kilometer-tons</i>
	<i>All distances</i>	<i>Per kilometer</i>			
	<i>in thousands</i>	<i>in millions</i>			
1913					
Etat	136,824	3,943	833	26,042	3,179
Nord	115,002	3,135	549*	52,558	5,408
Est	92,299	2,720	641	45,874	5,069
Paris-Orleans	59,078	3,014	656	20,703	4,077
P.L.M.	93,961	4,889	896	37,680	7,448
Midi	28,587	1,468	304	13,545	1,764
Totals	525,751	19,199	..	196,402	26,945
1914					
Etat	111,371	3,242	694	20,093	2,455
Nord	76,222	2,062	347*	31,798	3,339
Est	..	..	..	..	..
P.O.	45,565	2,496	566	16,631	..
P.L.M.	..	..	..	..	..
Midi	22,742	1,118	263	11,165	1,483
1915					
Etat	89,856	3,098	676	21,341	2,547
Nord	30,014	839	205	17,615	3,045
Est	40,915	1,092	347	9,928	1,510
P.O.	40,607	2,509	568	17,023	..
P.L.M.	..	..	..	..	..
Midi	22,324	1,173	254	11,338	1,538
1916					
Etat	108,799	3,489	874	22,691	2,706
Nord	37,856	949	309*	19,218	3,254
Est	45,985	1,191	478	12,495	2,121
P.O.	51,270	2,953	752	18,689	..
P.L.M.	..	..	..	..	..
Midi	29,974	1,320	355	10,717	1,486
1917					
Etat	115,101	3,327	747	22,015	2,738
Nord	43,323	1,070	282	19,980	3,575
Est	49,854	1,241	396	15,690	2,328
P.O.	57,477	2,878	728	19,454	..
P.L.M.	..	..	..	..	..
Midi	32,166	1,303	304	11,688	1,635
1918					
Etat	125,319	3,713	809	19,588	2,270
Nord	41,889	1,035	237	13,674	2,229
Est	51,020	1,264	345	10,711	1,506
P.O.	63,310	3,392	798	16,389	..
P.L.M.	..	..	..	..	..
Midi	32,631	1,287	343	10,345	1,497
1919					
Etat	143,060	4,448	953	23,550	3,091
Nord	79,355	3,222	198*	23,856	3,029
Est	79,245	2,741	523	17,881	2,631
P.O.	63,489	3,833	851	18,197	3,681
P.L.M.	81,436	4,513	822	27,077	7,871
Midi	30,687	1,492	379	10,584	1,453
Totals	477,272	20,249	..	121,145	21,756

* Excluding tonnage of cattle conveyed.

APPENDIX XL

MOVEMENT OF COMMERCIAL SHIPPING AT THE PRINCIPAL
PORTS (TOTAL OF VESSELS ENTERING
AND LEAVING, 1913-1919)

	1913		1914		1915	
	<i>Number of vessels</i>	<i>Tonnage (thousands of tons)</i>	<i>Number of vessels</i>	<i>Tonnage (thousands of tons)</i>	<i>Number of vessels</i>	<i>Tonnage (thousands of tons)</i>
Marseilles	17,568	21,254	16,289	17,628	12,365	14,431
Havre	13,407	11,109	11,914	..	12,676	6,811
Bordeaux	19,980	6,647	15,638	..	11,381	5,677
St. Nazaire	4,414	2,229	3,049	1,964	3,705	3,641
Rouen	8,793	5,262	7,892	4,706	12,680	7,437
Dunkirk	4,581	5,140	3,288	3,892	2,540	1,535
Boulogne	6,339	7,222	4,780	5,542	3,267	1,529
Calais	4,686	2,543	3,360	1,937	2,071	1,241
Dieppe	3,401	1,214	2,679	1,160	2,213	916
Other ports (Cette, Brest, La Rochelle, etc.)	..	..	..	..	..	..
Total of all French ports	210,670	95,460	171,518	78,272	146,126	64,700

APPENDIX XL

(Continued)

1916		1917		1918		1919	
<i>Number of vessels</i>	<i>Tonnage (thousands of tons)</i>	<i>Number of vessels</i>	<i>Tonnage (thousands of tons)</i>	<i>Number of vessels</i>	<i>Tonnage (thousands of tons)</i>	<i>Number of vessels</i>	<i>Tonnage (thousands of tons)</i>
11,703	12,890	8,352	8,389	8,209	6,143	10,121	10,558
16,788	8,078	15,217	6,960	22,076	7,739	16,825	8,458
11,211	6,860	9,213	4,696	8,787	4,668	9,611	4,358
4,193	3,372	3,838	2,430	3,564	1,952	3,440	1,939
18,113	8,948	17,897	8,069	25,461	9,346	19,784	8,301
4,802	3,027	2,612	1,681	845	544	3,805	3,063
3,149	1,257	4,264	1,410	4,465	1,585	5,249	2,581
2,644	1,030	2,966	718	3,608	719	4,562	1,106
2,132	848	2,251	703	2,725	643	2,465	809
..
161,971	69,362	152,125	53,572	170,695	51,351	166,845	58,397

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